THE NATIONAL RESPONSE FRAMEWORK: A CROSS-CASE ANALYSIS

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ABSTRACT

THE NATIONAL RESPONSE FRAMEWORK: A CROSS-CASE ANALYSIS, by
LCDR Michael S. DiPace, 152 pages.

The President approved the *National Response Framework* (NRF) in January 2008 to
serve as the nation's overarching document guiding the Federal Government's
management of all-hazards response. The purpose of this study is to assess the
performance of the NRF and identify any transcending capability gaps and performance
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moderately successful in guiding the delivery of response core capabilities in the
aforementioned disasters.

ACKNOWLEDGMENTS

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ACRONYMS

AAR	After-Action Report
ARC	American Red Cross
CMAS	Commercial Mobile Alert System
CMHS	Cheyenne Mountain High School
COML	Communications Unit Leader
COP	Common Operating Picture
CSFD	Colorado Springs Fire Department
CSPD	Colorado Springs Police Department
DA	Department of the Army
DCE	Defense Coordinating Element
DCO	Defense Coordinating Officer
DEP	Department of Environmental Protection
DMORT	Disaster Mortuary Operational Response Team
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of Interior
DR-1980	FEMA Disaster Declaration Number 1980
DRTF	Debris Removal Task Force
DTRS	Digital Trunked Radio System
EDR	Emergency Debris Removal
EF	Enhanced Fujita
EMS	Emergency Medical Services
ENS	Emergency Notification System

EPA	Environmental Protection Agency
ESF	Emergency Support Function
FCC	Federal Communication Commission
FCO	Federal Coordinating Officer
FIOP	Federal Interagency Operational Plan
FQS	FEMA Qualification System
GAO	Government Accountability Office
GIS	Geographic Information System
HHS	U.S. Department of Health and Human Services
HSPPR	Humane Society of Pikes Peak Region
IAP	Incident Action Plan
IC	Incident Commander
ICP	Incident Command Post
ICS	Incident Command System
IMAT	Incident Management Assistance Team
IMO	Incident Management Organization
JDO	Joplin Division Office
JFO	Joint Field Office
JIC	Joint Information Center
LIPA	Long Island Power Authority
LNO	Liaison Officer
MAFFS	Modular Airborne Fire-Fighting System
MOE	measure of effectiveness
MSSU	Missouri Southern State University
NBEOC	National Business Emergency Operations Center

NIFC	National Interagency Fire Center
NIMS	National Incident Management System
NLE 11	National Level Exercise 2011
NORTHCOM	U.S. Northern Command
NPAD	National Preparedness Assessment Division
NRCC	National Response Coordination Center
NRF	National Response Framework
NRP	National Response Plan
OEM	Office of Emergency Management
OSC	Operations Section Chief
PFA	psychological first aid
PIO	Public Information Officer
PPRCN	Pikes Peak Regional Communications Network
RFA	request for assistance
SCF	Surge Capacity Force
SCO	State Coordinating Officer
SMNS	Special Medical Needs Shelters
UCG	Unified Coordination Group
USAFA	U.S. Air Force Academy
USDA	U.S. Department of Agriculture
VIP	Very Important Person
WUI	Wildland Urban Interface

ILLUSTRATIONS

TABLES

CHAPTER 1

INTRODUCTION

We need to create a clear command and control structure that runs from the
federal government to the state—equivalent to the chain of command that's very
clear on the DOD [Department of Defense] side.
                                                        —Vice Admiral Thad Allen, *Time*

Overview

From 2004 through 2013, the U.S. languished through 654 major disasters, a

startling average of 1.2 per week, including 143 tornadoes, 97 hurricanes and tropical

storms, 12 wildfires, and 6 earthquakes.[1] The decade prior to that reveals similarly

alarming numbers, suggesting that the commonly used term "low-probably, high-

consequence events" to describe major disasters is misleading. U.S. shores, forests,

critical infrastructure, and citizenry will continue to be threatened each year by ferocious

storms, shifting subterranean plates, and the destructive combination of hot temperatures

and dry spells. Recent history of U.S. major disasters shows that limitations in national

preparedness led to unforgiving consequences. Hurricanes Katrina and Rita resulted in

1,500 deaths, $80 billion in damage, and 600,000 displaced homes.[2] Six months after

Hurricane Katrina demolished the Gulf Coast in late August 2005, multiple government

reviews diagnosed a profusion of failures in the Katrina response.[3] A bipartisan

Congressional investigation characterized the response to Katrina as "a litany of

mistakes, misjudgments, lapses, and absurdities all cascading together," and revealed a

"blinding lack of situational awareness and disjointed decision making."[4] A White House

lessons-learned review concluded, "emergency plans at all levels of government, from

small town plans to the 600-page National Response Plan—the Federal government's plan to coordinate all its departments and agencies and integrate them with State, local, and private sector partners—were put to the ultimate test, and came up short."[5] Katrina became the catalyst for major modifications to federal disaster response protocol.[6]

The President approved the National Response Framework (NRF) in January 2008 to serve as the nation's overarching document guiding the Federal Government's management of all-hazards response.[7] Two years prior, the Government Accountability Office (GAO) found the National Response Plan (NRP) did not meet the intent of the Homeland Security Act of 2002 to merge existing plans into an assimilated, singular plan.[8] Disaster response stakeholders universally agreed the NRP was too bureaucratic, lengthy, technical, and confusing.[9] The Post-Katrina Act mandated NRP revisions to provide for a clear chain of command and to more effectively address response requirements relative to a catastrophic incident.[10] The 2008 NRF replaced the NRP and incorporated key management structures, best practices, and lessons learned from Hurricanes Katrina and Rita, with a new focus supporting local communities and states.[11] The purpose of this study is to assess the performance of the NRF and identify any transcending capability gaps and performance shortfalls in the Framework that may lead to greater government efficiencies in future disaster response efforts. The targeted readership of this study includes emergency management professionals, academic scholars and students studying domestic disaster response, and others who have a baseline knowledge and interest in the topic.

The NRF was updated to its second edition in May 2013. This second edition was not a substantial makeover, but rather a refinement of document organization and

alignment with the National Preparedness Goal (the Goal) released in September 2011.[12] The Goal, triggered by PPD-8, defines success as, "A secure and resilient Nation with the capabilities required across the whole community to prevent, protect against, mitigate, respond to, and recover from the threats and hazards that pose the greatest risk."[13] The Goal describes the whole community approach in terms of 31 core capabilities necessary to minimize disaster risks (14 of which are response related) and identifies the following five mission areas of national preparedness:

Prevention: Prevent, avoid or stop an imminent, threatened or actual act of terrorism.

Protection: Protect our citizens, residents, visitors, and assets against the greatest threats and hazards in a manner that allows our interests, aspirations, and way of life to thrive.

Mitigation: Reduce the loss of life and property by lessening the impact of future disasters.

Response: Respond quickly to save lives, protect property and the environment, and meet basic human needs in the aftermath of a catastrophic incident.

Recovery: Recover through a focus on the timely restoration, strengthening and revitalization of infrastructure, housing and a sustainable economy, as well as the health, social, cultural, historic and environmental fabric of communities affected by a catastrophic incident.[14]

The NRF intends to clarify roles and responsibilities related to major terrorist attacks and pervasive natural disasters and explain how those roles and responsibilities should be integrated into local, state, and national coordination structures to deliver response core capabilities to a disaster area. The NRF's focus is solely on the response

mission area and how response synthesizes with the other aforementioned mission areas.[15] This study, therefore, concentrates exclusively on the response mission area.[*]

The most considerable modifications to the NRF in May 2013 included: (1) specifying the importance of a whole community approach to produce response capabilities, (2) describing how the nation executes the 14 response core capabilities identified in the Goal, (3) formalizing the 15 preexisting Emergency Support Functions (ESFs) as the principal federal coordinating structures for executing response core capabilities, (4) and removal of Partner Guides that provided sector-specific linkages to applicable sections of the NRF. An objective of the newest edition is to provide a baseline for development of a supplemental Response Federal Interagency Operational Plan (FIOP), which is expected to explain concepts of operations for delivery of core capabilities. The NRF is comprised of the 54-page base document, 15 ESF Annexes, 9 Support Annexes, and 7 Incident Annexes (see figure 1). The annexes provide supplemental material to further guide the application of the NRF. Emergency Support Function Annexes identify and describe functional areas comprised of resources and capabilities that are routinely called upon in major disasters. Support Annexes explain key support processes needed in most national responses. Incident Annexes explain the specific response aspects unique to different incident types.[16]

The following recent major natural disasters, stated by their formal titles, serve as backdrops to bound this study and assess the performance of the NRF: (a) Missouri Severe Storms, Tornadoes, and Flooding (April-June 2011), (b) Colorado High Park and

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[*]For the purposes of this thesis, the preceding mission area titles are written in lowercase format in reference to both the mission area definitions and the general use of the terms when alluding to associated activities within each mission area.

Waldo Canyon Wildfires (June-July 2012), and (c) Hurricane Sandy (October-November 2012).

Figure 1.   Organization of the NRF

Source: Federal Management Agency, *National Response Framework*, 2nd ed. (Washington, DC: Government Printing Office, 2013), 3.

The Missouri Severe Storms, Tornadoes, And Flooding disaster centered on the disastrous tornado that stomped a six-mile by three-quarters of a mile footprint of destruction on Joplin, Missouri, in the late afternoon on 22 May 2011. This Joplin tornado is the single deadliest tornado in the U.S. since 1947. This Enhanced Fujita-5 (EF-5) twister swept through southwest Missouri at over 200 miles per hour, causing over 160 fatalities and over 1,350 injuries in five days.[†] The region's main hospital suffered severe damage, as did thousands of residences, office buildings, and other structures. The

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[†]Tornadoes are rated on the EF scale from 0 to 5 (most severe) based on the type of damage and estimated winds.

response required help from all levels of government, private industry, and volunteer organizations.[17] The formal title of this major disaster is adjusted to "Joplin tornado" for the purposes of this thesis.

The Colorado High Park and Waldo Canyon Wildfires burned over 100,000 acres of land and destroyed over 600 homes in a 1-month period beginning 9 June 2012.[18] The High Park fire began first in Larimer County, approximately 175 miles north of Colorado Springs, while the Waldo Canyon fire began on 23 June 2012, 3 miles west of Colorado Springs, in El Paso County.[19] The Waldo Canyon wildfire proved to be the most destructive fire in state history and is this study's focus within the formally titled wildfire disaster; therefore, this study refers to the incident as the "Waldo Canyon wildfire" from this point forward. The Waldo Canyon wildfire took the lives of 2 people, forced the evacuation of 30,000 homes, wiped out over 14,422 acres of national forest, and destroyed 347 residences. At least 12 community organizations, 22 governmental agencies, 42 firefighting organizations, 13 law enforcement departments, 20 medical and behavioral groups, and 8 emergency management entities supported Colorado Springs during the disaster.[20]

Hurricane Sandy made landfall near Atlantic City, New Jersey, during the evening of 29 October 2012 with winds up to 80 miles per hour. Sandy devastated New Jersey, New York, and parts of Connecticut with heavy rain, extensive floods, strong winds, and storm surges up to 14 feet. Much of the East Coast suffered from the storm, including heavy snowfall in areas of West Virginia, Virginia, Maryland, and North Carolina. The storm killed over 160 people, scattered 23,000 people to find temporary refuge, destroyed or damaged hundreds of thousands of homes, and left 8.5 million

customers without power. FEMA pre-deployed 900 personnel, delivered over $1 billion in housing assistance, and executed over $800 million in debris removal and infrastructure restoration. Responders included over 17,000 federal personnel and over 11,000 National Guard members. Sandy ranks as the second largest Atlantic storm on record.[21]

Thesis

The NRF was moderately successful in guiding the delivery of response core capabilities in recent major natural disasters.

Research Question

Research seeks to answer the following question: How has the NRF performed in guiding emergency response actions in major natural disasters? Secondary questions that assist in answering the primary research question include: In relation to the fourteen response core capabilities, what capability gaps and performance shortfalls were identified for each of the cases? Can common capability gaps and performance shortfalls be identified across the cases?

Assumptions

The underpinning assumption to this research is that major natural disasters will continue to occur, disturbing the U.S. economy and the livelihood of Americans to different degrees. Secondly, the three case studies consisting of a tornado, a wildfire, and a hurricane are assumed to provide illustrations of the locations and types of disasters the U.S. will face in the foreseeable future. Furthermore, this study assumes the current conditions within the mitigation mission area remain constant for the foreseeable future

and, therefore, does not address cause-and-effect relationships between mitigation and response.

Another assumption is that current budget trends and priorities within the five mission areas of national preparedness will remain constant in the near future. Consequently, it is assumed that minimal effects on the response mission area emanate from modifications, improvements, or retrogression in other mission areas.

The study assumes each case had a distinctive transition between the response and recovery phases in order to plainly delineate a time period to examine. In reality, no established trigger points or set standards exist to distinguish when one mission area ends and another begins. Mike Parker, a member of the Federal Coordinating Officer (FCO) Cadre in FEMA Region VII who served as the Division Supervisor in Joplin, described the transition from response to recovery as it related to the Joplin tornado:

> If you talk to a purist about how disasters work, response and recovery are always happening. The instant there is a response you are automatically working on recovery, but its kind of a sliding scale. You go from a little bit of recovery to a lot of recovery, and a lot of response to a little bit of response. I will tell you that probably about the first or second of June, when you walked outside, there was a palpable difference in the attitudes of people, and we had gone from response to recovery. . . . Everyone at that point had been accounted for. . . . You could feel it in the air, we are done with the response. It's hard to put your finger on it, but it was there.[22]

There are some core capabilities within the cases with no substantial supporting evidence offered from referenced source documents. In those situations, the capability is assumed to have not played a substantial role in the response and thus not considered a shortfall.

Lastly, individual performance in terms of discipline, competence, or leadership skills can improve or degrade the delivery of core capabilities. The magnitude and scope

of this research makes it impractical to credit system-wide success or discount system-wide failures solely on individual performances. Therefore, all findings are assumed to reflect the national response network holistically.

<u>Definitions of Key Terms</u>

<u>Incident Command System</u>. A widely applicable management system designed to enable effective, efficient incident management by integrating a combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure. It is a fundamental form of management established in a standard format, with the purpose of enabling incident managers to identify the key concerns associated with the incident.[23]

<u>Major Disaster</u>. Any natural catastrophe (including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought), or, regardless of cause, any fire, flood, or explosion, in any part of the United States, which in the determination of the President causes damage of sufficient severity and magnitude to warrant major disaster assistance to supplement the efforts and available resources of states, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby.[24]

<u>National Incident Command System</u>. Provides a systematic, proactive approach to guide departments and agencies at all levels of government, nongovernmental organizations, and the private sector to work seamlessly to prevent, protect against, respond to, recover from, and mitigate the effects of incidents, regardless of cause, size, location, or complexity, in order to reduce the loss of life and property and harm to the

environment. It works hand in hand with the NRF and provides the template for the management of incidents, while the NRF provides the structure and mechanisms for national-level policy for incident management.[25]

National Preparedness System. The instrument the Nation will employ to build, sustain, and deliver the Nation's 31 core capabilities in order to achieve the goal of a secure and resilient Nation. The six components of the system include: (1) Identifying and Assessing Risk, (2) Estimating Capability Requirements, (3) Building and Sustaining Capabilities, (4) Planning to Deliver Capabilities, (5) Validating Capabilities, and (6) Reviewing and Updating.[26]

Post-Katrina Act. *Post-Katrina Emergency Management Reform Act of 2006* (Public Law 109-295), 4 October 2006. The Post-Katrina Act clarified and modified the Homeland Security Act with respect to the organizational structure, authorities, and responsibilities of FEMA and the FEMA Administrator. This act enhanced FEMA's responsibilities and its autonomy within DHS. Per the Post-Katrina Act, FEMA is to lead and support the Nation in a risk-based, comprehensive emergency management system of preparedness, protection, response, recovery, and mitigation. Under the Act, the FEMA Administrator reports directly to the Secretary of Homeland Security. FEMA is now a distinct entity within DHS, and the Secretary of Homeland Security can no longer substantially or significantly reduce the authorities, responsibilities, or functions of FEMA—or the capability to perform them—unless authorized by subsequent legislation. The act further directed the transfer to FEMA of many of the functions of DHS's former Preparedness Directorate.[27]

PPD-8. *Presidential Policy Directive / PPD-8: National Preparedness*. Issued 30 March 2011, PPD-8 aimed at strengthening the security and resilience of the United States through systematic preparation for the threats that pose the greatest risk to the security of the Nation. PPD-8 defines five mission areas—Prevention, Protection, Mitigation, Response, and Recovery—and mandated the development of a series of policy and planning documents to explain and guide the Nation's collective approach to ensuring and enhancing national preparedness.[28]

Stafford Act. Officially titled *Robert T. Stafford Disaster Relief and Emergency Assistance Act* (Public Law 93-288, as amended, 42 U.S.C. 5121-5207). The Stafford Act authorizes the programs and processes by which the Federal Government provides disaster and emergency assistance to State and local governments, tribal nations, eligible private nonprofit organizations, and individuals affected by a declared major disaster or emergency. The Stafford Act covers all hazards, including natural disasters and terrorist events.[29]

Whole community. A focus on enabling the participation in national preparedness activities of a wider range of players from the private and nonprofit sectors, including nongovernmental organizations and the general public, in conjunction with the participation of Federal, state, and local governmental partners in order to foster better coordination and working relationships (The Goal). Whole community includes: individuals, families, households, communities, the private and nonprofit sectors, faith-based organizations, and local, state, tribal, territorial, and federal governments.[30]

<u>Limitations</u>

No two disasters, nor their geography, infrastructure, governmental structures, and demographics, are alike. It would be impractical, in the time allotted, to examine all areas in the U.S. vulnerable to natural disasters. Therefore, this study does not consider differences in state organizational structures, resources, or capabilities beyond the states involved in the three case studies.

Case study results are derived from a limited number of seminal, widely circulated lessons-learned and after-action reports (AARs) in addition to a small number of opinion-based articles. Numerous documents and editorials have been written on each case study, but the set of references relied upon for this study is limited to keep the project manageable.

<u>Scope and Delimitations</u>

This study focuses on disaster response efforts to assess whether the response community is executing and achieving the functionality addressed in the NRF. All three of the major disasters referenced herein occurred prior to the 2013 NRF changes. When used in reference to the case studies, however, the term "NRF" refers to the 2013 edition. As mentioned earlier, the 2013 edition was not a substantial makeover from the 2008 version, but rather a refinement of document organization and alignment with the Goal. This thesis relies on the 14 response core capabilities identified in the Goal, and outlined in the NRF, as evaluation criteria. The 14 response core capabilities are not new concepts, as they were reflected in the 2008 NRF in a different form.[‡] Focus on the latest

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[‡]The 2008 NRF referred to 37 target capabilities, of which 26 pertained to response, that were described in the former *Target Capabilities List* version 2.0, released

version of the NRF is important in making an assessment of the most recent disaster response performance and doctrine. Three specific case studies were selected to establish a research foundation broad enough to encompass the most dangerous disaster types, but narrow enough to keep the analysis feasible. This study does not look to assess the application of the NRF following a terrorism event, oil spill, cyber attack, or pandemic, and it will only be assessed against certain major natural disasters in order to provide focus to the study. The response mission area is examined in a vacuum, mutually exclusive from the other four mission areas even though potential interdependencies exist. For example, stronger levee systems built in a flood zone as a mitigation factor might lessen the amount of response resources needed to facilitate mass evacuation or conduct search and rescue—a common argument presented by emergency management professionals. Studying the dependencies and interdependencies between the mission areas is beyond the scope of this research.

Although this study highlights disaster response success stories to validate areas where the NRF did well, it concentrates mainly on the prevailing shortfalls. Expounding upon deficiencies rather than triumphs better provides a springboard for action to implement improvements. Disasters often bring out the best in people—heroism, bravery, courage, and compassion. To remain firmly within the margins of this case study, praise to deserving responders is, unfortunately, not extended adequately.

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in September 2007. Each of the 26 legacy target capabilities map to one of the Goal's 14 core capabilities. Department of Homeland Security, *National Response Framework*, (Washington, DC: Government Printing Office, 2008), 9; Federal Emergency Management Agency, "Crosswalk of Target Capabilities to Core Capabilities," http://www.fema.gov/media-library-data/20130726-1854-25045-1651/crosswalk_1_.pdf (accessed 18 May 2014).

Study Significance

Catastrophes wreaked havoc on the U.S. in the last decade. The looming threat of future catastrophes leaves the Nation relying on the NRF to motivate and guide the whole community to expeditiously save lives, minimize damage to property and the environment, and provide essential services to displaced citizens. Public and private entities have written reports and lessons learned on recent major disasters to assess federal emergency management actions from different angles; however, little attention has been paid to researching crosscutting response capability gaps or performance shortfalls across unique disaster types. This study uncovers patterns of disaster response deficiencies across multiple states that dealt with different catastrophes and recommends new strategies to revise and integrate the NRF.

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CHAPTER 2

LITERATURE REVIEW

Budding investigators think that the purpose of a literature review is to determine the *answers* about what is known on a topic; in contrast, experienced investigators review previous research to develop sharper and more insightful *questions* about the topic.

—Dr. Robert Yin, *Case Study Research*, *Revised Edition*

Introduction

This chapter reviews literature to determine what has already been written and studied about the performance of the NRF in recent major disasters. Gaining awareness of research gaps, useful contributions, various analytical methods, and points of view from preceding studies helps solidify the significance of the research questions posed in this thesis. Review of a multitude of government guiding documents and laws provided a strong foundational background on the disaster response topic, but these documents are not the subject of this chapter. Instead, this literature review is devoted to scholarly books, research institution and consulting firm publications, government assessments, and newspaper and periodical articles that assert an opinion on the utility of the NRF or the current standing of domestic disaster response.

Scholarly Books

Dr. Stephen Flynn's *The Edge of Disaster* was published in 2007 after Hurricane Katrina, but prior to the NRF and prior to the three natural disasters studied herein. The author, who spent a decade as a senior fellow with the National Security Studies Program at the Council on Foreign Relations, describes the Nation's critical infrastructure as aging

and vulnerable to an attack or natural disaster. He assigns blame for this vulnerability on the stubborn devotion to a small government approach, disproportionate high investments in defense, and neglect of security and disaster response concerns on the home front. His solution involves strengthening the Nation's resilience by investing in and upgrading vital communication networks, transportation systems, power and water facilities, pipelines, refineries, and port infrastructure. Flynn makes a bold recommendation to put the Coast Guard in charge of federal disaster response. He asserts the Coast Guard's resounding success in the Hurricane Katrina response coupled with its convenient geographic footprint in nine districts makes the Service the best fit to take the lead.[1] Although Flynn's book focuses largely on the prevention, protection, and mitigation, and not the response mission areas of national preparedness, his work illuminates the disaster response shortfalls that triggered the creation of the NRF.

In *Learning from Catastrophes: Strategies for Reaction and Response*, the Wharton School, University of Pennsylvania professors Howard Kunreuther and Michael Useem gathered experts to collectively impart knowledge on risk management strategies that decision makers can employ to help reduce losses in low-probability, high-consequence events. The main premise of the book, published in 2010, is that the lack of adequate preparedness continues to be crisis management's greatest challenge because society remains more reactive than proactive.[2] The book's content is directed toward business leaders, but presents incisive recommendations to employ economic incentives, technology, and risk reduction strategies more effectively to better prepare for and respond to disasters.

Detlof Von Winterfeldt, an engineering and management professor at the University of Southern California, contributed Chapter 11 to *Learning from Catastrophes.* In Chapter 11, *Lessons from Risk Analysis: Terrorism, Natural Disasters, and Technological Accidents*, he argues risk analysis needs improvement and should consider extreme events, interlinked systems, and behavioral responses more deliberately. The author applauds the counterterrorism community for adapting traditional risk analysis methods such as decision trees and "red-teaming" (i.e. enhancing test scenarios) to suit the behavioral patterns of terrorist networks. He contends natural disaster preparedness could benefit equally from similar, creative approaches to risk analysis.[3]

Disaster Policy and Politics: Emergency Management and Homeland Security (2008) is a textbook-style reference intended for classroom study in higher education or the emergency management profession. Written by Dr. Richard Sylves, a political science professor at the University of Delaware and widely respected expert on emergency management policy, the book addresses the application of emergency management in the U.S., the importance of disaster research and education, leadership dynamics of elected officials during disasters, and civil-military relations. Sylves intended to present a balanced and unbiased familiarization of the topic, yet he draws several conclusions. Sylves agrees with Flynn's assertion that disaster policy is vulnerable to the "issue attention cycle." This term, coined by Anthony Downs in his 1972 article in *The Public Interest*, refers to the general idea that public interest rises, peaks, and falls over time following a major event.[4] Sylves suggests efforts to plan and prepare for natural disasters are overshadowed by counterterrorism interests due to the issue attention cycle.[5] Sylves also contends considering "mitigation" a stand-alone phase of emergency management

may be restrictive since it is not time constrained.[6] He stresses that unqualified political

appointees and interest groups can distract or derail appropriate disaster response action.[7]

He questions whether FEMA is too small to coordinate a large-scale, national response.[8]

The Center for Strategic and International Studies published an 87-page report

entitled *Managing the Next Catastrophe: Ready (or Not)?* in June 2008. The purpose of

the report was to provide major recommendations "toward getting America ready to

manage the next domestic catastrophe, whatever form it might take."[9] Members of the

federal government, think tanks, academia, state and local governments, and other groups

shared professional, experience-based insights and advice to improve the nation's

performance in the aftermath of another catastrophe. The principle author, Christine

Wormuth, argues, "America is not ready for the next catastrophe. . . . There are still no

detailed, government-wide plans to respond to a catastrophe."[10] Some of Wormuth's

recommendations in the report most closely related to the NRF include: (1) improving the

clarity of chain of command relationships between DHS and FEMA entities,

(2) increasing the emphasis for a DHS representative to always serve as the senior official

during a disaster response, even for "high end" events, (3) defining the conditions with

state governors ahead of time when the situation would call for the federal government to

unilaterally direct federal assets within a state to safeguard lives and property,

(4) developing an integrated set of interagency plans centered on the 15 National

Planning Scenarios and led by the National Security Council Strategic Planning

Directorate under the purview of DHS, (5) hosting tabletop exercises for Cabinet officials

shortly after election of a new President to enhance familiarity with catastrophic event

procedures and draw the Cabinet Secretaries' attention to critical vulnerabilities,

(6) infusing more of a "no-notice" surprise factor into national level exercises to better

test federal government coordination and collaboration with its own agencies and with

state and local governments, (7) bolstering FEMA regional offices throughout the nation

that can effectively serve as the critical conduit between Washington and a disaster zone,

and (8) commissioning homeland security task forces comprised primarily of National

Guard units.[11] Wormuth acknowledges that recent improvements have been

implemented, such as establishing the NRF and crafting 15 national planning scenarios,

but she contends that more progress is needed.[12]

Mission-Centered Solutions, Inc., a consulting firm that specializes in enhancing

organizational performance in intense, high-consequence environments, produced *A

Proposed Framework for Managing Catastrophic Incidents* in April 2011. The 44-page

document asserts that the current collection of national response doctrine provides

insufficient guidance for America to constructively respond to a major disaster. The

authors, Patrick Stevens and Mark Smith, focus their attention on the 2008 NRF and

NIMS, explaining the documents do not "adequately describe *how* strategic leadership is

to be exerted at the national and regional levels."[13] Stevens and Smith point out three

"critical gaps" in national response doctrine that they argue degrade disaster response

performance. The "critical gaps" include: (1) lack of a requirement for a Common

Operating Picture (COP) that provides strategic understanding in addition to situational

awareness, (2) lack of a methodology that guides the planning of large, complex

operations across multiple jurisdictions and time horizons, and (3) techniques to maintain

continuity of unified effort in the face of workforce transition, and when confronted with

competing priorities at different levels and across different agencies.[14] Stevens and Smith argue the weakness in the execution of the NRF lies in the one-dimensional, reactive nature of NIMS and ICS, which limits the scalability and flexibility the NRF strives to achieve.[15] In turn, the authors propose adding several concepts into NIMS doctrine to help close these "critical gaps" including: (1) vivification of a "top-down" intent that shapes responders' understanding of their tasks, (2) creation of a "Unified America" framework that delineates the strategic, theater (or operational), and tactical levels of incident management to overcome sharp jurisdictional, authoritative, or functional boundaries, (3) development and continuous refinement of strategic, theater (or operational) plans, and (4) incorporation of a visualization tool, or synchronization matrix, that plots tasks and objectives over time to help prioritize mission assignments and resources.[16]

<center>Government Assessments</center>

The GAO released *Wildland Fire Management: Improvements Needed in Information, Collaboration, and Planning to Enhance Federal Fire Aviation Program Success* in August 2013 to review Forest Service and Department of Interior (DOI) procedures for maintaining aerial firefighting support. Small air tankers are usually contracted by DOI, while the Forest Service contracts for large air tankers. Availability of large air tankers that drop retardant decreased from 44 to 8 between 2002 and early 2013 due to expiring lifecycles and a series of crashes. This rapid attrition of crucial assets led GAO to investigate whether the two agencies had a solid grasp of the number and type of aircraft they required to perform their mission, as well as learning about the Forest Service's acquisition procedures for modernizing the air tanker fleet. The GAO finding

most closely related to this thesis is that the Forest Service and DOI are not collecting

aircraft key performance and effectiveness data. States including California and Colorado

are beginning to doubt the ability of federal agencies to provide aerial firefighting aircraft

to wildfires and have begun considering procuring fleets of their own. The GAO

recommends the National Interagency Aviation Committee improve collaboration and

information sharing to help develop national wildfire firefighting strategies that reflect a

common understanding of aircraft capability and needs across agencies.[17]

One month after the abovementioned wildland firefighting recommendations were

published, the GAO found deficiencies in the military's disaster response organizational

structure as well. In September 2013, the GAO released *Civil Support: Actions Are*

Needed to Improve DOD's Planning for a Complex Catastrophe. The report evaluates

Department of Defense (DOD) planning, capabilities, and current command and control

structure for a multistate complex catastrophe. Findings of the report assert that DOD

plans are lacking a clear operational-level command construct for a large-scale incident.

National Level Exercise 2011 (NLE 11), which tested DOD's response to a massive

earthquake with catastrophic, multistate affects, exposed ambiguity in command element

relationships.[§] The GAO found that lacking a strong multistate command and control

structure inhibits the ability of U.S. Northern Command (NORTHCOM) to assign forces

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[§]The Congressionally-mandated, four-day NLE 2011 simulated an earthquake
along the New Madrid fault line that involved critical infrastructure damage across eight
states. More than 4,000 federal employees from 43 departments and agencies participated
along with over 6,000 regional, state, local, and private sector representatives.
Department of Homeland Security, Office of Inspector General, *National Level Exercise
2011—Federal Partner Participation*, OIC-12-01 (Washington, DC: Government
Printing Office, 2011), 1; Government Accountability Office, GAO-13-763, *Civil
Support: Actions Are Needed to Improve DOD's Planning for a Complex Catastrophe*
(Washington, DC: Government Printing Office, 2013), 18.

across multiple states in alignment with FEMA priorities.[18] The report acknowledges that

DOD has recently made improvements to integrate federal and state military forces under

a single commander when necessary.[19]

<u>Newspaper and Periodical Articles</u>

Tracy Hughes' February 2012 article in *Fire Engineering* speaks highly of the

NRF as the latest product in a progressive disaster response evolution spanning twenty

years. The author is the emergency planning coordinator for Galveston County, Texas. In

her article, "The Evolution of Federal Emergency Response since Hurricane Andrew,"

Ms. Hughes praises the NRF as a substantial improvement from the Federal Response

Plan in effect in 1992:

> The response driven by the NRF, with its more streamlined structure and clearer
> terminology and role definitions, surely would have been better than the
> confusion created by the cumbersome FRP [Federal Response Plan]. At the very
> least, Governor Chiles would have been able to understand the process better and
> would have made the request for assets sooner.[20]

Ms. Hughes regards the NRF as a streamlined document defining clear command

structures from the federal to local levels of government. She does not, however, address

the contributions of the NRF in recent disasters.[21]

In his *Washington Post* article from 2 November 2012, Steve Vogel summarizes

the impressions of emergency management experts, politicians, and the general public on

the Sandy response just one week after the storm struck New Jersey. In "FEMA is lauded

for response to Sandy," Vogel recaps an overwhelmingly positive reaction to FEMA's

efforts. He gives most of the credit to W. Craig Fugate, FEMA's Administrator. Vogel

explains Fugate ensured federal, state, and local governments were closely synchronized,

better than ever before. Vogel explains that FEMA's attention focused on security and

terrorism prior to Katrina, but the Post-Katrina Emergency Management Reform Act of 2006 (Post-Katrina Act) breathed new life into disaster management.[**] Vogel conveys that experts such as Edward Alden, director of the Renewing America Initiative at the Council on Foreign Relations, and Joseph E. Trainor, assistant professor with the Disaster Research Center at the University of Delaware, praised FEMA for learning from previous experience and demonstrating newfound agility by pre-positioning equipment. Although Vogel does not specifically mention the NRF, his positive reference to the Post-Katrina Act suggests he would conclude the NRF performed well in the aftermath of Katrina.[22]

In "Do We Need Federal Agencies like FEMA?" from the 21 November 2011 edition of *The New American*, Kelly Holt labels FEMA's insertion into the Bastrop fire response "an intrusion."[23] She argued FEMA showed up eight days after the disaster declaration, brought bureaucratic regulations, and was motivated primarily by funding availability. Holt said residents saw more direct help from volunteer organizations and churches than from FEMA. Holt acknowledges that FEMA has improved since Katrina, but claims the Agency is still slow to arrive on scene. The only benefit the federal government provided, she argued, was reimbursement for hardships in the recovery phase of the incident.[24]

[**]The Post-Katrina Act requirements are reflected in the NRF, to include key reporting relationships, coordination procedures in the event of local or regional communications loss, and state evacuation plan development. Government Accountability Office, GAO-09-59R, *Actions to Implement the Post-Katrina Act* (Washington, DC: Government Printing Office, 2008), 2-59.

Conclusions

The literature reviewed in this chapter spans the seven years from 2007 to 2013. Flynn, Kunreuther and Useem, Wormuth, and the GAO collectively depict the U.S. disaster response community, at least to some degree, as untrained, unequipped, and unprepared due to a lack of proactivity, a lean regional federal presence, disparate response plans across the government, and disjointed coordination. Flynn, Wormuth, and Stevens and Smith seem to favor more of a federal-led approach to disaster response management—Flynn promoting a big government approach to preparedness, Wormuth advocating for a senior DHS official to lead all major disaster response efforts, and Stevens and Smith encouraging a top-down commander's intent. The GAO, Wormuth, Hughes, Vogel, and Holt all recognized that the Nation's disaster response network has made progress since Hurricane Katrina; but they also agreed that more improvements are needed to some extent. Lastly, many of Sylves' points suggest there are numerous factors and influences in the execution of the NRF that must be considered, such as political influences and federal, state, and local agency organization.

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[1]Stephen Flynn, *The Edge of Disaster* (New York: Random House, 2007), 128-131.

[2]Howard Kunreuther and Michael Useem, *Learning from Catastrophes: Strategies for Reaction and Response* (Upper Saddle River, New Jersey: Pearson Education, 2010), xv.

[3]Detlof Von Winterfeldt, "Lessons from Risk Analysis: Terrorism, Natural Disasters, and Technological Accidents," in *Learning from Catastrophes: Strategies for Reaction and Response,* ed. Howard Kunreuther and Michael Useem (Upper Saddle River, New Jersey: Pearson Education, Inc., 2010), 186-189.

[4]Anthony Downs, "Up and down with ecology—the 'issue-attention cycle,'" *The Public Interest*, no. 28 (1972): 38-50.

⁵Richard Sylves, *Disaster Policy and Politics* (Washington, DC: CQ Press, 2008), 222.

⁶Ibid., 213.

⁷Ibid., 219.

⁸Ibid., 222.

⁹Christine E. Wormuth and Anne Witkowsky, *Managing the Next Domestic Catastrophe* (Washington, DC: Center for Strategic and International Studies, 2008), VII.

¹⁰Ibid., VI.

¹¹Ibid., VII-XIII.

¹²Ibid., VI.

¹³Mark T. Smith and Patrick L. Stevens, *A Proposed Framework for Managing Catastrophic Incidents* (Franktown, CO: Mission-Centered Solutions, 2011), 4.

¹⁴Ibid., 9.

¹⁵Ibid., 8.

¹⁶Ibid., 5, 17, 19-21.

¹⁷Government Accountability Office, GAO-13-684, *Wildland Fire Management: Improvements Needed in Information, Collaboration, and Planning to Enhance Federal Fire Aviation Program Success* (Washington, DC: Government Printing Office, 2013), 1-37.

¹⁸Government Accountability Office, GAO-13-763, *Civil Support: Actions Are Needed to Improve DOD's Planning for a Complex Catastrophe*, (Washington, DC: Government Printing Office, 2013), 19.

¹⁹Ibid., 16.

²⁰Tracy Hughes, "The Evolution of Federal Emergency Response Since Hurricane Andrew," *Fire Engineering* (February 2012): 94.

²¹Ibid., 90-94.

²²Steve Vogel, "FEMA is lauded for response to Sandy," *The Washington Post*, 2 November 2014.

[23]Kelly Holt, "Do We Need Federal Agencies Like FEMA," *The New American*, 21 November 2011, 21.

[24]Ibid., 21-24.

CHAPTER 3

METHODOLOGY

This research is predicated on the notion that a historical view of disaster response will generate a deeper understanding of current preparedness and will hopefully provide direction to an improved future state of readiness. Case studies provide an appropriate method to gain detailed insight and bring meaning to past events. The GAO and Dr. Robert Yin offer clarifying definitions of the term "case study." The GAO defines a case study as "a method for learning about a complex instance, based on a comprehensive understanding of that instance, obtained by extensive description and analysis of the instance, taken as a whole and in its context."[1] Yin defines a case study as "an empirical inquiry that investigates a contemporary phenomenon (the "case") in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident."[2]

A primary research question such as the one postured in this thesis—a "how" question—is best suited to what the GAO refers to as an "illustrative case study" and what Yin refers to as an "explanatory case study."[3] The GAO explains this type of case study is "intended to add realism and in-depth examples to other information about a program or policy," while Yin affirms the research approach addresses "operational links needing to be traced over time, rather than mere frequencies or incidence."[4] Yin further explains an "explanatory case study" is suitable for a situation where a researcher has no control over "actual behavioral events," yet can capitalize on a "full variety of evidence—documents, artifacts, interviews, and observations—beyond what might be available in a conventional historical study."[5] Since the case study theories just presented

are consistent, Yin's "explanatory case study" approach—with one exception—is followed for the purposes of this work. The exception involves the Waldo Canyon wildfire case, in which oral history interviews did not contribute to the evidence. Yin refers to the method where the researcher relies on strictly seminal and supporting documents or artifacts as a "history," where this method otherwise uses similar techniques as a case study.[6] Because the only difference between a case study and history as Yin defines them is the use of direct observations or interviews, the Waldo Canyon wildfire analysis is referred to as a case study for the purposes of this thesis.

Yin expands his singular case study theory to multiple cases, where a study can include two or more cases and glean generalizations or universal, "cross-case" conclusions.[7] In a multiple-case study, each case is first conducted independently through case-specific research and evidence collection to develop conclusions exclusive to that case.[8] A cross-case analysis follows that tests "replication logic," which postulates that analogous results from all cases are indicative of a general phenomenon, behavior, or pattern.[9] Yin's multiple-case study design provides an appropriate methodological approach to examine three recent major disasters.

Yin divides case study design into five components: (1) a case study's questions, (2) its propositions, (3) its unit(s) of analysis, (4) the logic linking the data to the propositions, and (5) the criteria for interpreting the findings.[10] The following sections in this chapter describe the case study design used for this thesis.

<div align="center">Case Study Questions</div>

Case study questions convey the topic and purpose of the research.[11] The case study questions introduced in Chapter 1 are restated here:

How has the NRF performed in guiding emergency response actions in major natural disasters? Secondary questions that assist in answering the primary research question include: In relation to the fourteen response core capabilities, what capability gaps and performance shortfalls were identified for each of the cases? Can common capability gaps and performance shortfalls be identified across the cases?

Propositions

Propositions are the researcher's initial theories or inklings that might answer the case study questions. Developing propositions helps guide the researcher toward something specific to be studied.[12] Two propositions that directed the course of this thesis were: (1) all levels of government strive to deliver the response core capabilities described in the NRF, and (2) shortfalls in NRF execution are constant across different types of disasters.

Units of Analysis

Yin uses the term "units of analysis" and "cases" interchangeably. At a minimum, two steps must be addressed when selecting the unit of analysis: (1) defining the case, and (2) bounding the case.[13] Three additional criteria drove the selection of cases: (1) ample documentation had to be available to support research, (2) the cases had to have been declared a major disaster by the President under the Stafford Act, and (3) the cases each had to be associated with a separate and distinct cause (e.g. earthquake, hurricane, fire, tornado, tsunami) excluding terrorist events, oil spills, cyber attacks, pandemics, or other intentional causes due to their distinct response requirements. Therefore, this study's unit of analysis is a major natural disaster. The following recent major disasters

meet the aforementioned criteria and define the three cases used in this multiple-case study: (1) Joplin Tornado (April-June 2011), (2) Waldo Canyon Wildfire (June-July 2012), and (3) Hurricane Sandy (October 2012-November 2012).[14] The bounds of each case are unique to the circumstances involved in each major disaster response—the duration, terrain, population density, and geographic expanse of the threat. The varied boundaries add realism to the multiple case study, as the scope of major disaster responses are routinely different. The major natural disasters selected as units of analysis provide illustrations of the locations and types of disasters the U.S. will likely face in the foreseeable future.

<div align="center">Logic Linking the Data to the Propositions</div>

This component of case study design involves employing an analytic technique that "foreshadows the data analysis steps in your case study research."[15] For the independent case studies in this thesis, evidence is presented and analyzed using Yin's "explanation building" technique. Explanation building is a form of pattern matching logic that uses a narrative format to explore "how" or "why" something happened.[16] The "internal validity" of the case study is bolstered if patterns point to a specific set of results.[17] For the cross-case aspect of this thesis, analysis is conducted using Yin's "cross-case synthesis" technique. This technique involves comparing findings across a group of independent case studies to determine if generalizations can be inferred through replication logic.[18]

<center>Criteria for Interpreting the Findings</center>

For simplicity, Yin depicts this final component of case study design in terms of a statistical analysis. He explains when statistical estimates are used as criteria, "statistically significant" results can be determined based on where observations lie relative to the criteria.[19] Criteria used in this multiple-case study are not as straightforward. The 14 response core capabilities defined in the NRF serve as the common criteria to assess the performance of the NRF in a cross section of endemic major disasters. Table 1 lists the response core capabilities and associated objectives, while table 2 lists associated critical tasks. Together, the two tables are intended to provide a solid understanding of the core capabilities, or criteria, used to assess the performance of the NRF in and across each of the disasters.

Analyzing evidence from a variety of reference material provides the opportunity to crosscheck and validate findings reported in singular sources. Yin refers to this crosschecking process as "triangulating," which he defines as "establishing converging lines of evidence."[20] Referenced documents and reports that provide case study evidence are by-and-large organized and catalogued differently than the NRF. Oftentimes results pertain to more than one core capability. Prudence was exercised to match published results with their respective, best-fit core capability. This study avoids using quantitative measures since the criteria are difficult to enumerate, but instead relies on the preponderance of published results from credible sources. Researcher discretion is exercised to draw conclusions after assessing the qualitative findings.

Table 1.   Response Core Capabilities and associated objectives in the National Preparedness Goal

Response Core Capability	Objective
1. Planning	Conduct a systematic process engaging the whole community, as appropriate, in the development of executable strategic, operational, and/or community- based approaches to meet defined objectives.
2. Public Information and Warning	Deliver coordinated, prompt, reliable, and actionable information to the whole community through the use of clear, consistent, accessible, and culturally and linguistically appropriate methods to effectively relay information regarding any threat or hazard and, as appropriate, the actions being taken and the assistance being made available.
3. Operational Coordination	Establish and maintain a unified and coordinated operational structure and process that appropriately integrates all critical stakeholders and supports the execution of core capabilities.
4. Critical Transportation	Provide transportation (including infrastructure access and accessible transportation services) for response priority objectives, including the evacuation of people and animals, and the delivery of vital response personnel, equipment, and services to the affected areas.
5. Environmental Response/Health and Safety	Ensure the availability of guidance and resources to address all hazards, including hazardous materials, acts of terrorism, and natural disasters, in support of the responder operations and the affected communities.
6. Fatality Management Services	Provide fatality management services, including body recovery and victim identification, working with state and local authorities to provide temporary mortuary solutions, sharing information with Mass Care Services for the purpose of reunifying family members and caregivers with missing persons/remains, and providing counseling to the bereaved.
7. Infrastructure Systems	Stabilize critical infrastructure functions, minimize health and safety threats, and efficiently restore and revitalize systems and services to support a viable, resilient community.
8. Mass Care Services	Provide life-sustaining services to the affected population with a focus on hydration, feeding, and sheltering to those with the most need, as well as support for reunifying families.
9. Mass Search and Rescue Operations	Deliver traditional and atypical search and rescue capabilities, including personnel, services, animals, and assets to survivors in need, with the goal of saving the greatest number of endangered lives in the shortest time possible.
10. On-Scene Security and Protection	Ensure a safe and secure environment through law enforcement and related security and protection operations for people and communities located within affected areas and for all traditional and atypical response personnel engaged in lifesaving and life- sustaining operations.
11. Operational Communications	Ensure the capacity for timely communications in support of security, situational awareness, and operations by any and all means available between affected communities in the impact area and all response forces.
12. Public and Private Services and Resources	Provide essential public and private services and resources to the affected population and surrounding communities, to include emergency power to critical facilities, fuel support for emergency responders, and access to community staples (e.g., grocery stores, pharmacies, and banks) and fire and other first response services.
13. Public Health and Medical Services	Provide lifesaving medical treatment via emergency medical services and related operations, and avoid additional disease and injury by providing targeted public health and medical support and products to all people in need within the affected area.
14. Situational Assessment	Provide all decision makers with decision- relevant information regarding the nature and extent of the hazard, any cascading effects, and the status of the response.

Source: Department of Homeland Security, *National Response Framework,* 2nd. ed. (Washington, DC: Government Printing Office, 2013), 20-24.

Table 2. Response Core Capabilities and Associated Critical Tasks in the National Preparedness Goal

Response Core Capability	Critical Tasks
1. Planning	Develop operational plans at the Federal level and in the states and territories that adequately identify critical objectives based on the planning requirements, provide a complete and integrated picture of the sequence and scope of the tasks to achieve the objectives, and are implementable within the time frame contemplated in the plan using available resources.
2. Public Information and Warning	(1) Inform all affected segments of society by all means necessary, including accessible tools, of critical lifesaving and life-sustaining information to expedite the delivery of emergency services and aid the public in taking protective actions. (2) Deliver credible messages to inform ongoing emergency services and the public about protective measures and other life-sustaining actions and facilitate the transition to recovery.
3. Operational Coordination	(1) Mobilize all critical resources and establish command, control, and coordination structures within the affected community and other coordinating bodies in surrounding communities and across the Nation and maintain, as needed, throughout the duration of an incident. (2) Enhance and maintain NIMS-compliant command, control, and coordination structures to meet basic human needs, stabilize the incident, and transition to recovery.
4. Critical Transportation	(1) Establish physical access through appropriate transportation corridors and deliver required resources to save lives and to meet the needs of disaster survivors. (2) Ensure basic human needs are met, stabilize the incident, transition into recovery for an affected area, and restore basic services and community functionality.
5. Environmental Response/Health and Safety	(1) Conduct health and safety hazard assessments and disseminate guidance and resources, to include deploying hazardous materials teams, to support environmental health and safety actions for response personnel and the affected population. (2) Assess, monitor, perform cleanup actions, and provide resources to meet resource requirements and to transition from sustained response to short-term recovery.
6. Fatality Management Services	Establish and maintain operations to recover a significant number of fatalities over a geographically dispersed area.
7. Infrastructure Systems	(1) Decrease and stabilize immediate infrastructure threats to the affected population, to include survivors in the heavily-damaged zone, nearby communities that may be affected by cascading effects, and mass care support facilities and evacuation processing centers with a focus on life-sustainment and congregate care services. (2) Re-establish critical infrastructure within the affected areas to support ongoing emergency response operations, life sustainment, community functionality, and a transition to recovery.
8. Mass Care Services	(1) Move and deliver resources and capabilities to meet the needs of disaster survivors, including individuals with access and functional needs. (2) Establish, staff, and equip emergency shelters and other temporary housing options ensuring that shelters and temporary housing units are physically accessible for individuals with disabilities and others with access and functional needs. (3) Move from congregate care to non-congregate care alternatives, and provide relocation assistance or interim housing solutions for families unable to return to their pre-disaster homes.
9. Mass Search and Rescue Operations	(1) Conduct search and rescue operations to locate and rescue persons in distress, based on the requirements of state and local authorities. (2) Initiate community-based search and rescue support operations across a wide geographically dispersed area. (3) Ensure the synchronized deployment of local, regional, national, and international teams to reinforce ongoing search and rescue efforts and transition to recovery.
10. On-Scene Security and Protection	(1) Establish a safe and secure environment in an affected area. (2) Provide and maintain on-scene security and meet the protection needs of the affected population over a geographically dispersed area while eliminating or mitigating the risk of further damage to persons, property, and the environment.
11. Operational Communications	(1) Ensure the capacity to communicate with both the emergency response community and the affected populations and establish interoperable voice and data communications between local, state, tribal, territorial, and Federal first responders. (2) Re-establish sufficient communications infrastructure within the affected areas to support ongoing life-sustaining activities, provide basic human needs, and transition to recovery.
12. Public and Private Services and Resources	(1) Mobilize and deliver governmental, nongovernmental, and private sector resources within and outside of the affected area to save lives, sustain lives, meet basic human needs, stabilize the incident, and transition to recovery, to include moving and delivering resources and services to meet the needs of disaster survivors. (2) Enhance public and private resource and services support for an affected area.
13. Public Health and Medical Services	(1) Deliver medical countermeasures to exposed populations. (2) Complete triage and the initial stabilization of casualties and begin definitive care for those likely to survive their injuries. (3) Return medical surge resources to pre-incident levels, complete health assessments, and identify recovery processes.
14. Situational Assessment	(1) Deliver information sufficient to inform decision making regarding immediate lifesaving and life-sustaining activities, and engage governmental, private, and civic sector resources within and outside of the affected area to meet basic human needs and stabilize the incident. (2) Deliver enhanced information to reinforce ongoing lifesaving and life-sustaining activities, and engage governmental, private, and civic sector resources within and outside of the affected area to meet basic human needs, stabilize the incident, and transition to recovery.

Source: Department of Homeland Security, *National Response Framework,* 2nd. ed. (Washington, DC: Government Printing Office, 2013), 20-24.

<u>Data Collection Methods</u>

Case-specific AARs and lessons-learned studies provide the evidential foundation for this thesis. Sources providing the majority of the evidence are summarized at the beginning of each case study, but other references offer telling details and are simply cited in endnotes and the bibliography.

Researcher-led oral history interviews with two federal officials, Mike Parker and Brian Ebert, provide supplemental personal perspectives on the NRF and individual insights into disaster response processes. Parker played a central role in the Joplin tornado response, while Ebert was integral in the Hurricane Sandy response. Their experiences in these major disasters served as focal points for the oral histories. Both interviews were executed consistent with the ethical research standards published by the National Research Council in 2003, which reflects the principles of the 1979 Belmont Report to respect the volunteer interviewees and protect them from any harm.[21] Both interviewees provided "informed consent" by signing Department of the Army (DA) Form 7273, Access Agreement for Oral History Materials, and thus voluntarily agreed to allow the Army to use the contents of their interview and make recordings of their interview available to the public if requested, subject to the Freedom of Information Act, Privacy Act, and DA Information Security Program.[22] Recordings of the interviews will be stored with their respective DA Form 7273 in the Combined Arms Research Library (CARL), Fort Leavenworth, Kansas.

Mike Parker, a member of the FCO Cadre assigned to FEMA Region VII, shared his experiences and reflections on disaster response and the NRF. Federal Coordinating Officers are appointed by the President upon declarations of major disasters or

emergencies to coordinate federal relief efforts in affected areas.[23] Parker's emergency

management experience spans 35 disasters across 13 states, beginning in 2001 as the

Defense Coordinating Officer (DCO) for 2 years in FEMA Region V while an active duty

U.S. Army colonel. He joined FEMA as an FCO in January 2007, taking on assignments

in six out of ten FEMA regions in addition to FEMA Headquarters. Parker has real-world

experience with nearly all disaster types, with the only exceptions being an earthquake,

tsunami, and chemical spill.[24]

Brian Ebert, the Plans and Operations Officer at Defense Coordinating Element

(DCE) Region VII (DCE VII) based in Kansas City, Missouri, also shared his

experiences and reflections on disaster response and the NRF. Defense Coordinating

Elements are staffs of approximately nine civilian and military liaison officers in direct

support of the DCO who arrange federal military forces to support activated ESFs.[25] The

DCO is the senior official representing DOD during an incident, responsible for

answering requests for federal military assistance, divvying up tasks (i.e. mission

assignments) to various military commands for action, and tracking progress of

applicable ESFs.[26] Ebert began working as an emergency management specialist at DCE

VII in 2009, and contributed to three major disaster response operations: (1) Hurricane

Irene in Maryland (2011), (2) Hurricane Isaac in Mississippi (2012), and (3) Hurricane

Sandy in Maryland, New Jersey, and New York (2012).[27]

<u>Analysis Format</u>

The analysis format follows the same pattern for each case study. Case study

narratives begin with a profile of the destruction area and an incident summary that

describes the magnitude of the event, specific challenges, and major impacts. The

ensuing discussion is separated by 14 subheadings, 1 for each response core capability. Each of these subparagraphs hones in on recorded actions (and sometimes inaction) taken at all levels of government associated with the subheading's core capability. Due to time and space limitations, many (but not all) success stories are omitted from these discussions while the bulk of shortfalls are accentuated. Emphasizing shortfalls does not imply that the disaster response community performed poorly or that the NRF failed within a core capability; rather, this approach will hopefully broaden dialogue and instigate future improvements.

An analytical table, conceptualized in figure 2, is presented at the conclusion of Chapter 4 to indicate the performance of each core capability within each case and to identify transcending core capability shortfalls across all three cases.
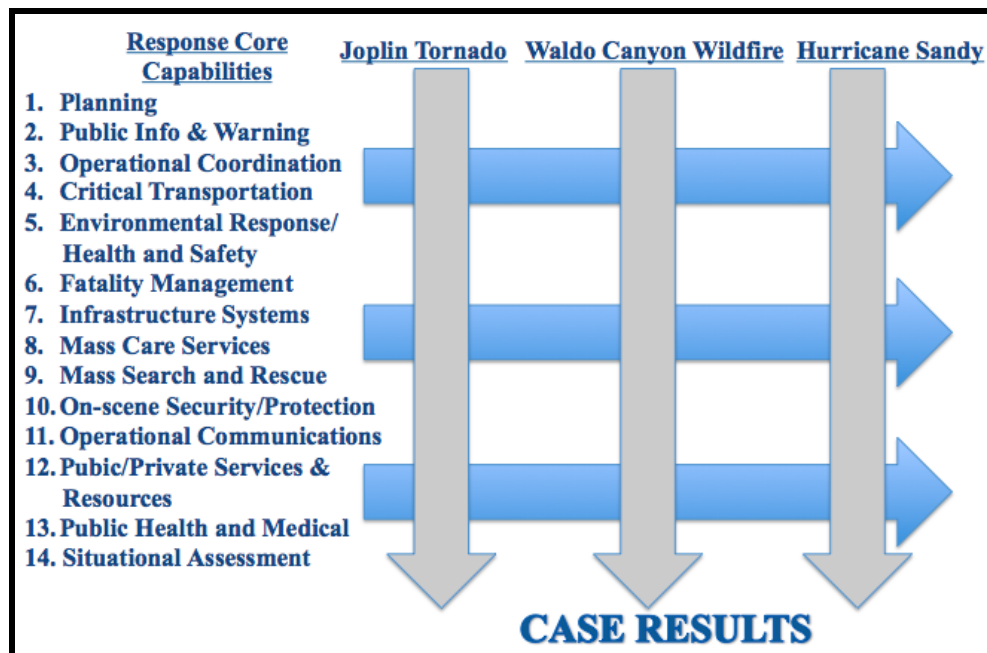
Figure 2.   Cross-Case Analysis Method

Source: Created by author

Lastly, Chapter 5 presents conclusions drawn from the cross-case synthesis that explain capability shortfalls pervasive within the disaster response community, regardless of the type of disaster they are responding to. In Yin's words, endemic "operational links" and "contextual conditions" are uncovered in Chapter 5 that explain the crosscutting results, or replications.[28] By default, core capabilities not identified as crosscutting shortfalls, or replications, are considered to have been delivered satisfactorily for the purposes of this study. In other words, where crosscutting shortfalls are prevalent, this thesis contends the NRF is underperforming; whereas if crosscutting shortfalls do not exist for a given core capability, this thesis contends the NRF is performing well to guide delivery of that capability.

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[1]Government Accountability Office, GAO/PEMD-91-10.1.9, *Case Study Evaluations* (Washington, DC: Government Printing Office, 1990), 145.

[2]Robert K. Yin, *Case Study Research: Design and Methods*, 5th ed. (Thousand Oaks, CA: SAGE Publications, 2014), 16.

[3]GAO, *Case Study Evaluations*, 9; Yin, *Case Study Research*, 5th ed., 10.

[4]Ibid.

[5]Robert K. Yin, *Case Study Research: Design and Methods*, rev. ed., vol. 5 of *Applied Social Research Methods Series* (Newbury Park, CA, 1989), 16; Yin, *Case Study Research*, 5th ed., 12.

[6]Yin, *Case Study Research*, 5th ed., 12.

[7]Ibid., 18.

[8]Ibid., 59.

[9]Yin, *Case Study Research*, rev. ed., 53-55.

[10]Yin, *Case Study Research*, 5th ed., 29.

[11]Ibid., 11.

[12]Ibid., 30.

[13]Ibid., 31.

[14]Federal Emergency Management Agency, "Disaster Declarations by Year," http://www.fema.gov/disasters/grid/year (accessed 13 May 2014).

[15]Yin, *Case Study Research*, 5th ed., 35.

[16]Ibid., 147.

[17]Ibid., 143.

[18]Ibid., 164-165.

[19]Ibid., 36.

[20]Robert K. Yin, *Applications of Case Study Research*, 3rd ed. (Thousand Oaks, CA: SAGE Publications, 2012), 13.

[21]Constance F. Citro, Daniel R. Ilgen, and Cora B. Marrett, eds., *Protecting Participants and Facilitating Social and Behavioral Sciences Research* (Washington, DC: National Academy of Sciences, 2003), 23-28.

[22]Department of the Army, Army Regulation 870-5, *Military History: Responsibilities, Policies, and Procedures* (Washington, DC, 2007), chap. 8, sec. 1; Department of the Army, *Access* DA 7273, *Agreement for Oral History Materials*, (Washington, DC, March 2012).

[23]*Stafford Act*, § 5143.

[24]Parker, interview.

[25]Brian Ebert, interview by author, Fort Leavenworth, KS, 23 January 2014; Department of the Army, Army Doctrine Reference Publication No. 3-28, *Defense Support of Civil* Authorities (Washington, DC, 2013), chap. 3, sec. 2.

[26]Ibid.

[27]Ebert, interview.

[28]Yin, *Case Study Research*, 5th ed., 10, 16.

CHAPTER 4

DATA FINDINGS AND ANALYSIS

We must continue to communicate our focus on the needs of the survivors. We must not allow ourselves to define success by the implementation of our programs, nor should we make the survivors fit our process.
—Administrator W. Craig Fugate, *Hurricane Sandy: FEMA After-Action Report*

2011 Joplin Tornado

Profile of Destruction Area

Joplin, Missouri is located approximately 160 miles south of Kansas City, and had an approximate population of 50,000 people and a population density near 1,500 people per square mile in 2011.[1] Joplin was considered the fourth largest metropolitan area in Missouri with an approximate daytime population of 270,000 people within a 40-mile radius of the city. Agriculture, education, health and social services, manufacturing, and retail trade are the City's predominant industries. Joplin is home to 2 hospitals, 20 public schools, and 3 colleges.[2]

Incident Summary and Impact

The EF-5 tornado struck Joplin at 5:41 p.m. local time on Sunday, 22 May 2011, 24 minutes after the National Weather Service (NWS) issued a tornado warning. The vortex, with winds exceeding 200 miles per hour, ripped through Joplin for 6 miles and led to 161 fatalities, 1,371 injuries, 4,380 destroyed homes, 9,200 displaced residents, over 1,300 displaced pets, 500 disabled businesses, and 3 million cubic yards of debris. Damage to the St. John's Regional Medical Center triggered a 90-minute evacuation of 183 patients. Two fire stations, the Home Depot, and Wal-Mart were destroyed. Figure 3

displays the tornado's path through Joplin. City, county, state, and federal officials joined

hands in the response. Together they established four joint task forces—Housing, Debris

Removal, Schools, and Critical Infrastructure—to coordinate resources and prioritize

objectives.[3]
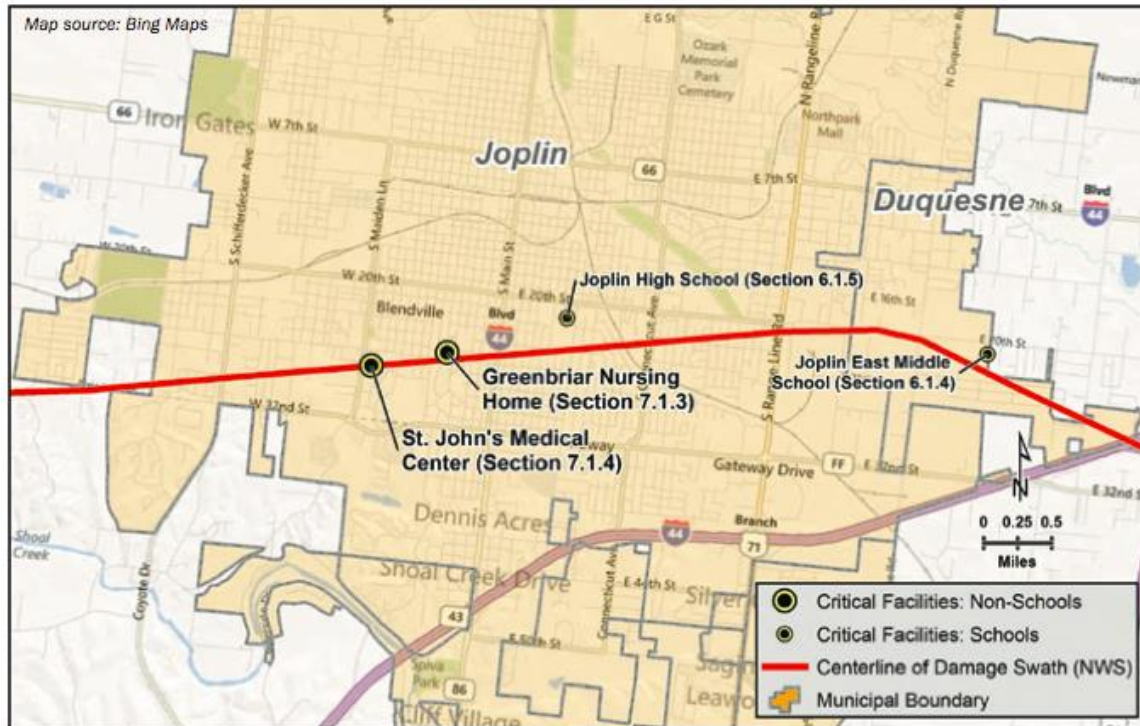
Figure 3.   Joplin Tornado Path of Destruction

Source: Federal Emergency Management Agency, *Mitigation Assessment Team Report: Spring 2011 Tornadoes: April 25-28 and May 22* (Washington, DC: Government Printing Office, 2012), 5-3.

Primary Sources Conveying Disaster Response Results

The Response to the 2011 Joplin, Missouri, Tornado: Lessons Learned Study was

published by FEMA on 20 December 2011, approximately seven months after the

destructive event. The National Preparedness Assessment Division (NPAD) of FEMA's

National Preparedness Directorate teamed with FEMA Region VII to assess the whole

community's and FEMA's response to the tornado through in-person interviews with federal, state, and local officials, and data analysis. The report points out that FEMA's infusion into the response was streamlined since the Agency was already operating in Missouri for two months in response to severe winter storm affects from January and February. These affects were exacerbated several weeks later by destructive tornados and severe flooding from spring storms. The response to the Joplin tornado was folded into the FEMA Disaster Declaration Number 1980 (DR-1980) for the spring storms. The team viewed the Joplin tornado response as one of the first opportunities to evaluate the "whole community" approach, which entails incorporation of capabilities from every available resource in the community. The team identified 22 preliminary findings, which are described in the subsequent paragraph titled "2011 Joplin Tornado Results." The joint FEMA Region VII and NPAD team conclude the disaster response was a resounding success because the whole community came together and rose to the occasion.[4]

Daniel Smith and Daniel Sutter's article, "Response and Recovery after the Joplin Tornado: Lessons Applied and Lessons Learned," in the Fall 2013 edition of *The Independent Review* presents a case study on the Joplin tornado. The case study seeks to identify the recovery roles played by private and public sectors and determine whether the findings from Katrina would resurface in a disaster in a different environment. The authors' research included interviews with public officials, business owners, and residents. They say the community was inspired with a team attitude, as demonstrated by churches, private businesses, and volunteers who shared resources with community members in need. Smith and Sutter identified the most obvious contrast from Katrina to be Joplin's decentralized recovery planning. The authors were also impressed by

FEMA's performance, indicating there were no signs "of the obstructionist behavior …

chronicled after Katrina."[5]

The oral history interview with Mike Parker centered on his experiences as

Division Supervisor in Joplin during the first 12 days of the response. The appointed

FCO, Libby Turner, was already operating out of the Joint Field Office (JFO) in

Columbia, Missouri, about 230 miles northeast of Joplin, to coordinate recovery efforts

for a disaster caused by snow, ice, and floods earlier in the year. Parker deployed to

Joplin independently the morning after the tornado, prepared to meet the 14-person

FEMA Region VII Incident Management Assistance Team (IMAT) reassigned to him

from the Columbia JFO. The President approved the Governor's verbal request to include

Joplin in the preexisting disaster by amending the former declaration, opening the

necessary channels for federal assistance.[6]

<center>2011 Joplin Tornado Results</center>

<u>Planning Capability</u>

Jurisdictions in southwest Missouri were well-trained and well-equipped. Years of

training and planning have occurred in this area of Missouri. The Emergency

Management Institute, under FEMA, trained emergency management personnel in

Incident Command System (ICS).[7] Local officials participated in NLE 11 a week prior to

the tornado and attended the annual three-day Four Corners Emergency Management

Conference in early December 2010, less than six months prior to the tornado.[8] The Four

Corners conference included exercises and professional development in emergency

management topics.[9] Federal, state, regional, local, and private industry personnel

responded effectively in large part due to their participation in NLE 11. During the Joplin

<center>44</center>

tornado response, FEMA and Missouri officials tapped the well-founded working

relationships built during NLE 11. The national level exercise involved emergency

managers practicing critical plans such as casualty evacuation, mutual aid, and

Emergency Management Assistance Compact (EMAC) procedures as well as operating

the Joplin Emergency Operations Center. Emergency manager's familiarity with plans

and procedures generated a streamlined response to the Joplin tornado.[10] Parker verified

that the familiarity he had with state emergency managers and procedures gave him the

feeling that the Joplin response was simply a continuation of NLE 11.[11]

Historical data from similar disaster responses was not leveraged by FEMA to

help inform decision-making. Personnel in the JFO had no handy benchmarks to help

understand and predict response requirements related to cost, processes, and available

capabilities. This shortfall shed light on a wider gap in disaster response data collection

and predictive modeling at the FEMA Headquarters level. No institutional processes or

systems were in place to evaluate past disaster data that will help JFO personnel better

plan for a response upon activation.[12]

Parker pointed out that it is not a small task to socialize and inculcate a document

like the NRF into state and local processes. Reconfiguring and adjusting to new

frameworks can be an expensive proposition. Furthermore, state emergency management

staffs are limited in size, and employees often have multiple responsibilities—emergency

preparedness being only one of them. During the Joplin response, Parker recalls the

Missouri plan was somewhat aligned with the NRF. National Level Exercise 2011

provided an ample opportunity for FEMA and Missouri to align earthquake plans, which

turned out to greatly facilitate the tornado response because it familiarized everyone

involved with terminology and procedures. Exercises that involve all levels of government, Parker added, are the "forcing functions" to align state and local emergency managers and plans with federal guidance.[13]

<u>Public Information Capability</u>

The National Weather Service (NWS), the media, and emergency management officials collectively and sufficiently provided advanced notice of the tornado along with crucial safety and sheltering information. Despite the first warnings, particularly those from the NWS Springfield Weather Forecast Office and a local siren, the majority of Joplin residents did not immediately respond by seeking shelter; rather, many of them waited for additional indicators before being convinced of the enormity of the situation. Some of the indicators they sought included direct observation of the cyclone, a second siren, or a sense of urgency from radio or television reporters. The National Weather Service is exploring methods of warning that resonate in a more credible way with the public.[14]

City officials effectively delivered important messages to the public via social media, press conferences, and news alerts. The Facebook page contained phone numbers, shelter information, donation opportunities, debris removal procedures, and methods to apply for FEMA assistance. Joplin's Public Information Officer (PIO) partnered with local PIOs to share and publish information in nearby communities.[15] A challenge that arose was keeping up with the public's information demands. The JFO Planning Section was understaffed and consequently unable to follow social media trends during the response.[16]

The Joplin Division Office (JDO) teamed with 73 FEMA Region VII staff members from Kansas City to conduct a community outreach surge on 31 May, 9 days after the tornado struck. The team disseminated circulars in English and Spanish to impacted populations conveying application procedures for disaster assistance, crisis counseling, legal assistance, and other services. This initiative expedited delivery of relief resources to those in need.[17]

Within a week following the tornado, the state established a temporary assistance center that reminded Parker of a "county fair-like" tent.[18] Likewise, FEMA set up a call center with 30 booths in an area that became somewhat of a recovery center zone, across from the shelter at Missouri Southern State University (MSSU). Relief experts answered residents' questions one-on-one, passed out informative pamphlets with curfew limits and insurance claims contact information, and provided advice to avoid potential hazards.[19]

Operational Coordination Capability

Soon after Mike Parker's first engagement with the city and county managers, FEMA and state officials promulgated four task forces based on focus areas of greatest need. Independent task forces included Housing, Debris Removal, Schools, and Critical Infrastructure. The task forces met daily with a diverse membership, seeking to rapidly and collaboratively provide relief to their respective focus areas.[20] Parker primarily coordinated with the city and county manager, and he informed higher authorities through the Operations Section Chief (OSC) in Columbia, Missouri. The State was not directly represented on-scene in Joplin with the emergency management leadership team, but the State Coordinating Officer (SCO) worked directly with the JFO. The State did, however, have the appropriate representatives integrated into the task forces. Parker

explained that the SCO's absence was not a burden to coordination, as the city kept the state informed separately—yet in parallel—with operations. Parker leveraged close ties with FEMA legal offices to verify compliance with the Stafford Act. He indicated the lawyers at FEMA are dedicated to finding legal solutions, rather than being quick to deny a resource due to the letter of the law.[21]

Coordination challenges occurred with the arrival of volunteer responders who acted on their own initiative without synchronizing with incident managers. Many of these volunteer responders were executing response activities, specifically search and rescue, without the proper equipment or training. For example, responders and search and rescue teams searched the same structures more often than necessary due to inconsistent, nonstandard search markings used by volunteers. Proper check-in would have improved coordination and reduced safety concerns. Incident managers did employ standard procedures such as establishing staging areas and check-in procedures, and distributing Incident Action Plans (IAPs) to manage and convey objectives to responders.[22]

Credentialed FEMA contracting officers were scarce during the aftermath of the tornado. Personnel at the JFO largely relied on FEMA Headquarters for contract support, which proved to be inefficient in the execution of voluminous purchases inherently associated with a major disaster response.[23]

Adding the Joplin tornado to a previous declared major disaster, DR-1980, facilitated FEMA's swift involvement in the response; however, the expansion of DR-1980 resulted in some challenges as well. For instance, amendments had to be made to the IAP that convoluted the plan's message. Additionally, the JFO was conducting recovery operations and had to flex its mission and staff for response activities. Federal,

state, and local officials were not fully aware of potential consequences to augmenting an existing declaration.[24]

Several coordination shortfalls between the JFO and the JDO existed, as approximately 230 miles separated the 2 offices. The JFO endured high turnover of Disaster Assistance Employees (DAEs).[††] Some JFO representatives stated it was unclear who their counterparts were in the JDO, some roles and responsibilities were disputed between the JFO and JDO, and the organizational structure provided little opportunity for interoffice collaboration. These challenges delayed information processing and decision-making.[25]

The FEMA workforce was getting stretched thin in attempts to respond to multiple national disasters. This was particularly true of FEMA Region VII's IMAT. To add to the strain, several FEMA officials expressed that the standing policy for deploying a Regional IMAT was unclear.[26] Regional IMAT teams, typically composed of 4 to 10 staff members, are ideally structured to deliver an immediate, forward federal presence after a disaster. Instituting the unified command and providing situational awareness are the IMAT's foremost concerns.[27] The team is comprised of a team lead, operations section chief, planning section chief, logistics section chief, and leads for external affairs, public assistance, and individual assistance. FEMA Region VII's IMAT filled important jobs within the JFO in Columbia when the tornado struck Joplin. The devastation

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[††]Disaster Assistance Employees are temporary, on-call FEMA employees who augment the emergency organizational structure during specific disasters or emergencies. More than 9,000 DAEs were employed by FEMA as of February 2012, on two-year appointments. Government Accountability Office, GAO-12-538, *Disaster Assistance Workforce: FEMA Could Enhance Human Capital Management and* Training (Washington, DC: Government Printing Office, 2012), 7.

triggered the Regional IMAT to relocate to Joplin and abandon their posts, leaving a critical gap in expertise at the JFO. The JFO now faced the daunting task of managing the Joplin situation in addition to the preexisting flood recovery, all with an attritted workforce. The remaining workforce at the JFO scrambled to find qualified personnel to fill the voids and thus struggled to retain an organized relationship with the JDO. An ambiguous policy addressing the IMAT's span of control added further confusion to the response.[28]

The JFO Planning Section was consequently understaffed and was unable to follow social media trends during the response. To plus-up the workforce due to the high demands, FEMA tapped into its Automated Deployment Database, a reserve workforce program, in an attempt to find qualified workers to fill vacant positions in the JFO. Qualified workers with skills currency were scarce and required on-the-job training that detracted from productivity.[29] A GAO report from 2012 subsequently recommended several overhauls to the reserve program to improve fidelity of the system and establish a nationwide, standardized repository of FEMA employee qualifications.[30] Moreover, several JFO workers suffered from serious medical conditions unrelated to the incident that prevented them from contributing as expected. Medical related personnel shortfalls could have been avoided had supervisors understood their subordinates' circumstances.[31]

Neither the JFO nor JDO were following the "Planning P" process of ICS or using the standardized administrative controls directed by the Incident Management Handbook.[32] Parker observed that the State EOC was effectively using the "Planning P," the division of responsibilities was appropriate, and capabilities were being delivered on time.[33]

The FCO promptly assigned a liaison officer (LNO) on a one-to-one basis with each key local government official. The LNOs proved to be critical conduits for streamlined information sharing by providing clear lines of communication to and from all levels of government. This avoided the need for emergency managers to dissect organizational charts and gather lengthy contact rosters as they had single points of contact, familiar on a personal level, to get things done.[34]

Critical Transportation Capability

Assessing the area for the first time less than 24 hours after the tornado destroyed the town, Mike Parker observed the roads in and around the destruction area were predominantly open to vehicular traffic and debris was piled adjacent to the streets. After a tornado of this magnitude, he would not have expected clear roads for four days, after debris clearing crews were ordered and organized. Instead, road access was available because locals emerged with all the skid-steer loaders and excavators they could muster. The community knew they needed to unite in this effort to help emergency crews find survivors. Emergency vehicles freely accessed the disaster zone and the need for search and rescue aviation assets was significantly reduced as a result.[35]

Environmental Response/Health and Safety Capability

On 23 May, FEMA commenced Individual Assistance, debris removal, and emergency protective measures for affected areas within Jasper and Newton counties. FEMA instituted a 75-day debris removal pilot program 8 days later, called Emergency Debris Removal (EDR), which raised the federal share of debris removal costs from 75 to 90 percent. Although the application of the program benefits as they related to the

Stafford Act relief effort proved to be confusing during the recovery phase, EDR enabled rapid clearance of dangerous and obstructive material from the roadways and rights-of-ways in the immediate days after the tornado.[36] The U.S. Army Corps of Engineers (USACE) was mission-assigned by FEMA to conduct debris removal with the Missouri National Guard fulfilling state oversight responsibilities. By 7 August, all three million cubic yards of tornado-generated debris were hauled away from the disaster area, meeting FEMA's contractual deadlines.[37]

Local officials were concerned about lead poisoning, as up to 1,500 homes were possibly contaminated. Joplin's rich history as home to the lead and zinc mining industry is the reason soil samples were registering high for old lead deposits within a year following the tornado. This turned out to be more of a long-term, recovery challenge rather than an immediate problem affecting the response.[38] The Environmental Protection Agency (EPA) moved in to set up asbestos and lead monitoring sites.[39] The issue gained momentum in November 2011 when the Joplin Health Department released a map of historical mining areas.[40] Joplin since received federal funding from EPA in February 2014 to help the lead cleanup.[41]

Fatality Management Services Capability

Fatality management needed improvement. Although the U.S. Department of Health and Human Services (HHS) stood up a Disaster Mortuary Operational Response Team (DMORT) within two days of the tornado at the immediate request of Jasper and Newton counties, the DMORT could only process two to three victims per day due to the challenges of identifying the victims. Coroners stopped allowing family members from identifying victims after a mistake was made, and the Governor designated the Highway

Patrol to assume responsibility for victim identification and to account for the 268 missing persons. Volunteers participated in body recovery, but were often untrained in fatality management to include the mental stress aspect of the activity.[42]

Infrastructure Systems Capability

The tornado wiped out everything inside the destruction zone, yet infrastructure was unscathed along the periphery of the zone. The day after the tornado, Mike Parker observed a hospital, police and fire stations, emergency management facilities, city and county government offices, and convenience stores open and operational. Responders' immediate priorities included securing utilities to the affected areas, to avoid further damage or personal harm.[43] The very evening following the tornado, water, gas, electric, and cellular services were back online for residences deemed safe due to proactive actions by local utility providers.[44] Parker did note that cell phone networks were occasionally overloaded as expected.[45]

Mass Care Services Capability

Three hundred displaced victims found cover at the MSSU shelter courtesy of the American Red Cross (ARC), while others took advantage of hospitality offered by families or friends.[46]

The private sector was instrumental in coordinating the vast majority of temporary lodging for displaced households, while FEMA was able to accommodate the remainder of residents in need of housing units. Approximately 98 percent of the temporary accommodations were within 25 miles of Joplin.[47]

Multiple non-governmental organizations established animal shelters at the MSSU campus to allow victims to co-locate with their pets.[48] The heat became a hazard for the stray cats, dogs, and other pets. Mike Parker recalls the animal shelter coordinator contacting him to request cooling systems to moderate the temperature, and FEMA was able to quickly help. Parker and the shelter coordinator established a working relationship at NLE 11, which paid off when dealing with the high temperatures in Joplin. They each knew who to contact and where to look.[49]

Tyson Foods established a full service grill under a tent within 24 hours of the tornado to offer 3 complimentary meals a day to survivors and responders. Tyson stayed for 14 days, serving 120,000 pounds of food.[50] Parker said resources such as the "Tyson Tent" just appeared—the whole community approach was in effect.[51]

Mass Search and Rescue Operations Capability

The rescue and care for hundreds of animals was an overwhelming success. Multiple non-governmental organizations were called upon to conduct animal search and rescue. Both federal agencies and non-governmental organizations provided veterinary support, addressed environmental impacts (i.e. heat) on the animals, and facilitated the trapping of displaced pets.[52]

Parker explained FEMA employed national assets to obtain satellite imagery and conduct spatial analysis using Geographic Information System (GIS) technology. Technicians created customized, color-coded maps to indicate geographic severity of damage, which helped prioritize areas of greatest concern for lifesaving and debris removal.[53]

<u>On-Scene Security and Protection Capability</u>

The city smoothly implemented curfews for the protection of residents by Tuesday evening. The area was well patrolled with no challenges such as looting arising.[54]

<u>Operational Communications Capability</u>

Overall, radio and satellite communications ran smoothly in Joplin. The Joplin EOC leveraged satellite capabilities from another area in the State to augment communications.[55] The Federal Emergency Management Agency deployed a Mobile Emergency Operations Vehicle with satellite, UHF, VHF, 800 MHz radio, Voice over Internet Protocol (VoIP), FEMA intranet, and Internet connectivity and communication services to support the IMAT and FCO.[56]

Several shortfalls arose with traditional email and cell phone communications, however. As expected, the JFO and JDO used email and cell phones as their primary means to provide updates to each other and to responders in the field. Employees of FEMA reported email storage reached capacity limits, so many important notices vanished. Furthermore, field workers were not equipped with smart phones and they faced numerous complications working government laptop computers.[57]

<u>Public and Private Services and Resources Capability</u>

All levels of government in Joplin were accommodating to the private and nonprofit sectors. In fact, the private sector served as the key driver of the response while federal, state, and city officials took a more hands-off approach.[58] Volunteers converged on Joplin from all over the U.S. and even Japan to help clear approximately half of the

1.5 million cubic yards of debris caused by the tornado. Churches and other community

organizations provided thousands of meals to volunteers and first responders. The ARC

established a shelter and resource center for survivors immediately, activated a phone

number to receive donations, and coordinated with the Salvation Army and Catholic

Charities to prioritize resource needs. Counselors resourced by the ARC helped survivors

deal with the devastation. The Joplin YMCA stepped up to offer free childcare for those

in need. Furthermore, the private sector provided temporary lodging to 90 percent of the

5,000 to 7,000 displaced households.[59]

Mike Parker boasted that the whole community approach and culture of

preparedness Joplin exhibited was exemplary. When asked what was particularly unique

about Joplin's preparedness, he explained:

> That's why they call it the Heartland. . . . You have farmers, laborers, people who
> help their neighbors. I see this time and time again in Missouri in particular. The
> couple times I've been deployed there, we try to provide shelters and no one
> shows up to the shelters. Well where are they? They're at their church, they're at
> their families', they're at their neighbors', or they're at their friends'. . . . Very,
> very family-centric kind of place. And so when one person is suffering,
> everybody piles on to help.[60]

The State and region embraced and capitalized on several community

preparedness programs.[61] AmeriCorps, for example, managed the Volunteer Reception

Center at MSSU, processing and tracking 3,000 volunteers in the first 16 hours after

opening. The Center served as a call center to receive missing person reports and

augmented the United Way's information hotline.[62]

Leveraging the EMAC enabled more than 800 police cars, 300 ambulances, 400

fire trucks, and 1,100 responders to arrive in Joplin within 24 hours after the tornado.[63]

The coordination with local fire departments was extremely successful. The Joplin fire

department lost two of its five fire stations to the tornado. The fire department had to respond to the disaster as well as cover unharmed areas with standard services. Pre-arranged agreements with fire departments from across southwest Missouri enabled 400 fire trucks and firefighters to augment the Joplin fire department. The Southwest Missouri Incident Support Team provided a command-level officer to lead coordination.[64]

Twenty national corporations sent teams of employees who volunteered to provide helping hands, while other large, prominent companies brought specific resources. Tide® Loads of Hope™ offered mobile laundry service, Duracell Power Relief Trailer brought complimentary batteries, flashlights, and charging stations, Georgia-Pacific delivered paper towels and industrial wipes, and Stanley and Black & Decker delivered tools.[65] There are too many examples of private sector help to list them all.

Public Health and Medical Services Capability

The reaction of emergency medical professionals, Emergency Medical Services (EMS) personnel, and volunteers was exemplary. They evacuated 183 patients from destroyed St. John's Regional Medical Center, mobilized critical patients 1 mile to Freeman Hospital, and improvised ad-hoc solutions to overcome lack of medical supplies and field triage locations. There was some early disruption to medical care because people were not informed of the damage to St. John's.[66] Doctors from Arkansas and Oklahoma arrived unexpectedly and provided needed augmentation to Freeman's staff. The hospital had not trained how to rapidly verify credentials of supplemental assistance, but that did not prove to constrain medical care. Missouri has taken steps to implement a reciprocity system for health care professionals.[67] In addition to the medical resources at

Freeman Hospital, substantial medical staff activated by the State and a 60-bed mobile field hospital funded by HHS were operational 6 days after the tornado.[68]

Fourteen local health organizations participated in an immediate effort to prevent disease by administering tetanus vaccines to responders working in the debris field. Beginning the day after the tornado and carrying on for several weeks, community members received over 17,000 vaccinations at stationary and mobile stations.[69]

Medical personnel set up an improvised triage center at the St. Paul's United Methodist Church the evening of the tornado, which suffered significant damage. Despite the damage, emergency surgery was performed on tables in the church's children's area.[70] This example reflects the community's cohesion and creativity to help one another.

Situational Assessment Capability

The Federal Emergency Management Agency did not have reliable information management systems in place, and was unable to promptly access tactical data. The Agency did not possess a software program or process that consolidates multiple sources of data and displays graphical overlays comparable to a state or local EOC system. Lack of a sophisticated system degraded FEMA's ability to synthesize a useful COP. This obstacle coupled with unreliable laptop computers resulted in receipt of muddled tactical data. For example, the JDO obtained housing figures from the Staging, Logistics, and the Housing Task Force that were duplicative and conflicting with its own data collected.[71]

Mike Parker contends that the emergency management community needs improvement in developing information plans at the outset of a response. In all of Parker's disaster response experience, he never saw information collection executed

well—including in Joplin. Parker says a good information plan should define critical information requirements, responsible parties, the frequency of collection, and decisions the information will be used to inform. During the Joplin response, he only had fourteen pairs of eyes on his team and was thus shorthanded in his ability to develop a broad situational assessment. The National Response Coordination Center (NRCC) had a wider lens to assess the situation with feeds from national media outlets. The IMAT was better suited to collect specific, ground-level information. Since no national-level information gathering priorities were set, Parker improvised his own tactical information plan that sufficed in the absence of a formal plan.[72]

2012 Waldo Canyon Wildfire

Profile of Destruction Area

The nearly one million acres of Pike National Forest are located about three miles west of the City of Colorado Springs, Colorado.[73] The Colorado Springs metro area covers about 195 square miles with approximately 650,000 people. Roughly 156,000 of these residents live within the Wildland Urban Interface (WUI), an area of mainly forested and vegetated foothills that stretches 28,000 acres from the United States Air Force Academy (USAFA) to the Cheyenne Mountain Air Force Station.[74]

Incident Summary and Impact

The Waldo Canyon Wildfire was reported at noon on 23 June 2012 and burned over 18,000 acres of land in 18 days.[75] At one point, the fire covered 3 miles in 45 minutes.[76] The majority of destruction occurred in the Pike National Forest, just three miles west of Colorado Springs (see figure 4). The wildfires forced the evacuation of

30,000 homes and destroyed 347 residences in Colorado Springs and El Paso County. At least 12 community organizations, 22 governmental agencies, 42 firefighting organizations, 13 law enforcement departments, 20 medical and behavioral groups, and 8 emergency management entities supported Colorado Springs during the disaster.[77] Over one thousand firefighters from local communities and the USAFA, two engineer battalions from the U.S. Army 4th Infantry Division, four military C-130 tankers, and several military helicopters responded.[78] The military aircraft responded under NORTHCOM command and control as requested by the National Interagency Fire Center (NIFC) in Boise, Idaho.[79][‡‡] This wildfire was the first incident in which a dual-status commander was appointed by the President and Governor to oversee federal forces and state National Guard forces under a single command since the concept was codified in 2011.[80]

[‡‡]NIFC is the nation's support center for wildland firefighting, with eight different agencies and organizations coordinating mobilization of assets for wildland fire and other incidents. National Interagency Fire Center, "Mission," http://www.nifc.gov/aboutNIFC/about_mission.html (accessed 20 May 2014).
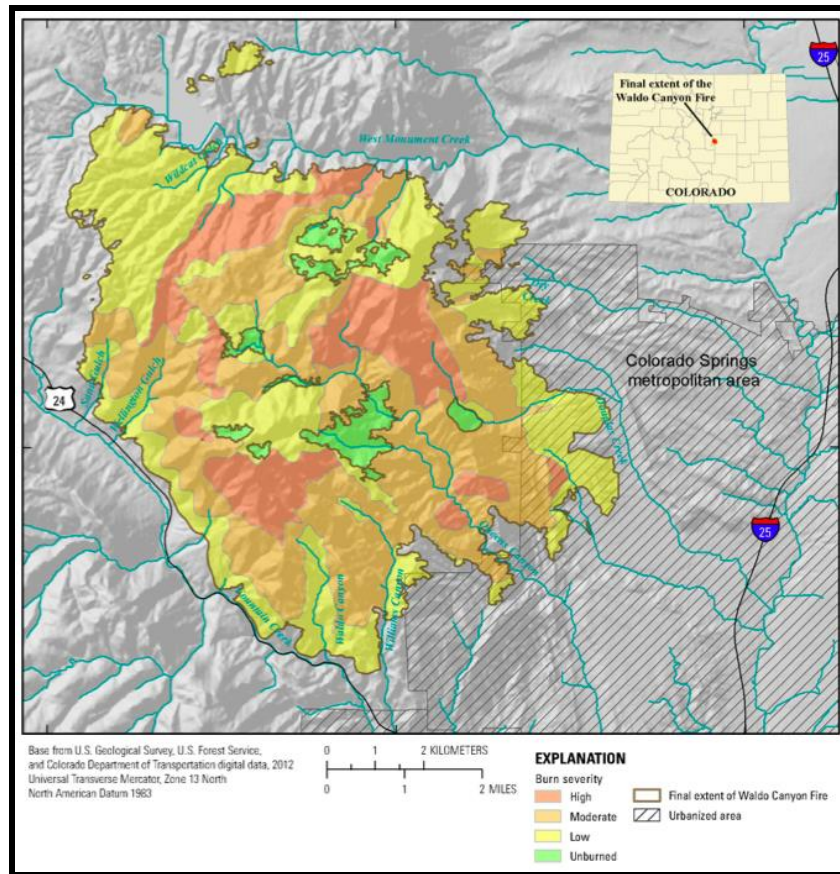
Figure 4.　Location and Severity of the 2012 Waldo Canyon Fire

Source: Kristin L. Verdin, Jean A. Dupree, and John G. Elliott, "Probability and Volume of Potential Postwildfire Debris Flows in the 2012 Waldo Canyon Burn Area near Colorado Springs, Colorado," Geological Survey, http://pubs.usgs.gov/of/2012/ 1158/OF12-1158.pdf (accessed 19 May 2014), 7.

Primary Sources Conveying Disaster Response Results

In June 2013, the U.S. Department of Agriculture (USDA) Forest Service published *Waldo Canyon Fire Review: Pike and San Isabel National Forests*. A six-person team from the USDA Forest Service National Incident Management Organization conducted the assessment by scouring response data and documentation and interviewing key decision makers involved in the aftermath. The purpose of the Review was to

identify lessons learned and enhance risk-based decision-making across the broader fire community. The review team found strengths in preparedness training, leadership, obedience to protocol, and overall Incident Management Team (IMT) execution. The team concluded the response was deficient in decision-making with respect to evacuations, compatibility of federal and county communication networks, and incorporation of military assets among other areas for improvement.[81]

The City of Colorado Springs released *Waldo Canyon Fire, 23 June 2012 to 10 July 2012: Final After Action Report* on 3 April 2013. This 111-page AAR concentrates exclusively on the City's disaster response policies, procedures, and actions taken at the WUI. The purpose of the AAR was to develop actionable recommendations that could improve Colorado Springs' performance in a future disaster response. The AAR does not address Colorado Springs' interagency and interstate interactions in order to provide a narrow focus on internal strengths and lessons learned.[82]

Results of the final AAR stem from extensive reviews of responders' radio recordings and numerous post-incident meetings attended by state and local government officials and private and non-profit organization representatives. The AAR identifies several major strengths related to Colorado Spring's disaster response efforts including collaboration, pre-incident training, and thorough plans. The AAR also found areas in need of improvement including interagency coordination, real-time documentation, logistics staffing, and familiarization with ICS.[83] The AAR directs its audience to the *Initial After-Action Report*, released on 23 October 2012, for results related to:
(1) volunteer and donations management, (2) emergency public warning, (3) medical

surge, (4) medical supplies management and distribution, and (5) mass care. The initial AAR is also referenced in this case study.

2012 Waldo Canyon Wildfire Results

Planning Capability

The City of Colorado Springs maintains a comprehensive set of emergency response plans. Emergency managers heavily relied on these plans prior to and during the incident to exercise and train with public safety organizations, disseminate pubic information, execute evacuation procedures, identify and protect critical infrastructure, and manage personnel assignments.[84] Checklists and job aides reflecting the plans, on the other hand, were not widely used and could have facilitated EOC operations. The City also did not establish work schedules for response personnel and were forced to contrive a second shift of workers after three days into the incident. The ad hoc relief employees were not all properly trained for their new assignments.[85] Additionally, Colorado Springs did not keep detailed records of decisions and responses, as attention on immediate needs overcame the need to capture data.[86]

Colorado Springs Office of Emergency Management (OEM), Colorado Springs Police Department (CSPD), and Colorado Springs Fire Department (CSFD) teamed with several homeowner associations to conduct WUI evacuation drills that incorporated Emergency Notification System (ENS) warnings, evacuation walk-throughs, simulated response actions, and a debrief with responders and residents. In general, this preparation led to safe, instinctive reactions during the incident. The CSFD Division of the Fire Marshall and Colorado Springs OEM supplement these drills with robust public information outreach programs that educate residents on proper preparation for

emergencies. These programs included public meetings, speaking engagements, wide dissemination of safety guides, and Citizen Emergency Response Training.[87]

Local organizations were unfamiliar with the processes of IMT functionality. Additional pre-incident IMT training likely would have streamlined interactions between local assets and state and county teams.[88]

Pre-incident testing of Colorado Springs' cellular coverage and capacity could have helped the city predict loss of communications at Holmes Middle School, the location of the Incident Command Post (ICP) for the Type 1 IMT. The dead spot caused CSFD and CSPD to relocate their mobile command posts. Potential ICP locations were not thoroughly preplanned, nor were they assessed for connectivity prior to the incident.[89] In fact, the CSPD relocated six times during the response due to technology failures and other workspace and proximity limitations.[90] Antiquated computer systems at the EOC required substantial troubleshooting and delayed information sharing. The Joint Information Center (JIC) lacked recording equipment and an adequate number of televisions for monitoring news outlets.[91] Had a cyclical equipment testing process been in place prior to the incident across response locations, the aforementioned technology and infrastructure shortfalls likely would have been rectified.[92]

Managing and assigning volunteers presented a notable challenge. Colorado Springs' volunteer program, Community Advancing Public Safety, provided one hundred volunteers on the first day.[93] Although the volunteers were instrumental in disseminating critical information to the public and managing the check-in process at the EOC, city officials were not prepared to react to the surge of do-gooders. Volunteers ready to serve could have played a bigger role had they been offered specific, pre-incident training.[94]

<u>Public Information Capability</u>

In addition to media outlets bringing local and national attention to the fire, the Forest Supervisor coordinated effective community outreach through a network of city and county officials. Although a formal JIC plan was not in place at the time of the incident, an impromptu plan was executed well. Media staging areas were located near Coronado High School and the University of Colorado at Colorado Springs, both near ICP locations and offering plenty of parking for media representatives wanting access to top officials.[95]

People with disabilities reported a lack of live captioning and sign language interpreters on TV and at shelters prevented them from staying abreast of current information. Television stations, with the exception of KKTV, were not willing to pay for this service, and argued the City needed to provide the funds if the service was to be delivered on their channels. No mutual agreement between the City and TV stations had been pursued. People with disabilities were not sufficiently notified that cell service was down, and some were unable to register for ENS notifications because they understandably did not have email addresses needed for registration.[96]

Keeping pace with the brisk fluidity of social media activity proved to be a significant challenge. Agencies had ground rules in place limiting the content that could be published on sites like Facebook and Twitter, which further obstructed responsiveness to the public's demands for information.[97] Colorado Springs did, however, provide the public with phone numbers to reach the JIC located at the El Paso County Sheriff's Office. Trained volunteers answered the phones and provided critical information to residents. The City and County also established separate Twitter accounts for each of

their pertinent offices to provide short-fused notices to the public under the hashtag "#waldocanyonfire," which allowed emergency managers to connect instantly with an abundance of the population.[98]

A profusion of highly interested elected officials converged on the scene with the intention of receiving situational updates and briefings. The IMT and civilian authorities were heavily consumed in response efforts, and tending to each Very Important Person (VIP) overloaded available staff. The President of the United States, Governor of Colorado, Colorado's Congressional delegation, Secretaries of Agriculture and Homeland Security, Chief of the Forest Service, and Under Secretary for Natural Resources and Environment were among the VIPs.[99]

The Colorado Springs Police Department leveraged multiple communication strategies on the first day of the incident to spread evacuation messages in two neighborhoods. The most direct and reliable method used was knocking on doors. Police officers successively alerted dispatch of those snubbing the evacuation notifications. This process improved CSPD's familiarity with the procedures and neighborhoods, which simplified the implementation of mass evacuations on 26 June.[100]

Although communications during the evacuation operation ran smoothly overall, one area for improvement involved conveying evacuation and re-entry timeframes and guidelines to residents with clear definitions and consistency. Emotions ran high and impromptu questions about evacuations were answered with unfamiliar terms, such as "pre-evacuation" and "mandatory evacuation," which led to confusion and increased risk.[101] In the Mt. Shadows area, residents were given the order to evacuate, followed the next day by permission to return, and finally ordered to vacate the area yet again on the

third day.[102] Evacuation instructions left out some key information, such as reminders to reduce cell phone use that could inhibit emergency services and descriptions of one-way traffic patterns. For those with hearing or language barriers, not all media outlets offered closed captioning or translations.[103] Furthermore, while CSPD conducted round-the-clock patrols in evacuated and pre-evacuated areas, the City did not publicize the patrols to residents, who were often left unaware of security measures in place.[104]

The two mass emergency notification systems underperformed during the fire. The *MassCall* system could not handle the volume of notifications without delivery error, while *Communicator! NXT Server* was inhibited by a lack of circuits linking it to the telephone network. Telephone service providers and emergency authorities did not have a partnership in place to share customer information such as numbers and location.[105] Other forms of notification to residents noted earlier seem to have overcome the technology challenges associated with these two call systems, including the 218,000 ENS notifications sent by the El Paso Teller E911 Authority.[106]

Operational Coordination Capability

Dissention between multiple organizations was apparent due to an absence of preplanned agreements.[107] One exposed planning challenge in the Waldo Canyon wildfire that is common to most wildfires was the lack of preparation and ownership of perimeter control operations. In addition, A lack of agreements with the military and predetermined roles and expectations for the military led to confusion over the employment of military capabilities, such as the Modular Airborne Fire-Fighting System (MAFFS), a portable fire retardant delivery system activated from a military C-130 aircraft. A plane arrived at Peterson Air Force Base in Colorado Springs on the second day of the fire (24 June)

ready to respond, but waited 24 hours due to orders that said to be ready "no earlier than" noon on 25 June. The national center that activates assets, NIFC, did not have a presence on-scene yet.[108] This confusion became apparent to the public since there were no plans to share with the media and explaining the civil-military relationship was difficult. Despite the aforementioned military planning challenges, civil and military authorities worked through the issues efficiently. The colonel who served as a liaison officer was able to deliver swift assets upon request, such as medevac helicopters.[109]

In the first 36 hours of the fire, the Type 3 Incident Commander (IC) assembled and employed members from a Type 2 IMT completing operations at an incident close by. This augmentation of experienced personnel significantly relieved the strain on the Type 3 team that was rapidly becoming overwhelmed by the calamity of events.[110]

Responders who were interviewed stated Forest Service administrators shared critical information adequately.[111] The City of Colorado Springs activated their EOC swiftly upon report of the fire and quickly became the central clearinghouse to coordinate evacuations, public messaging, logistics, and purchases.[112] Information flow and frequent contact between the EOC and IMTs were successful at the outset of the incident; however, EOC personnel became encompassed with a surge of undertakings as the fire encroached the City boundaries.[113] Personnel and crew accountability and tracking were absent, even in the most dangerous incident locations where it should have been a greater focus.[114]

The complexity of the fire and wide array of tactics needed to respond called for a multi-functional Incident Management Organization (IMO) comprised of several agencies from different jurisdictions. The Type I IMT led a well-orchestrated team effort,

matching specialized skillsets of local fire departments with strategic leaders from other agencies. The complementary faculties of IMO participants led to sharp coordination and unified priorities.[115] The Type I IMT held daily "cooperator meetings" to improve relationships, reassess "values at risk," and strategize evacuation plans.[116] Prior to the incident, CSFD instituted restructured reporting protocols for two fire stations in order to have a clear, single chain of command to the District Chief. The new reporting relationships enhanced accountability within CSFD's Wildfire Suppression Program.[117]

The fire and police departments initially stood up a Type I ICP at Holmes Middle School upon realization of the fast spreading fire.[118] Holmes was relatively close to the fire and offered practical capabilities and staging areas.[119] Co-location enabled smooth information sharing, operational coordination, and logistics efficiencies. Although radio and cellular disruptions ultimately triggered relocation, in-person interactions overcame the technology gap to a sufficient degree.[120] The subsequent separation of the ICPs, though, created roadblocks in communication and coordination between CSFD and CSPD.[121]

The Logistics Section at the Colorado Springs' EOC efficiently exercised existing contracts, established new purchasing arrangements, and oversaw and disbursed donations to deliver critical resources across the incident area. City credit cards enabled logistics personnel to track their budget efficiently and purchase vital supplies swiftly.[122] When the fire breached city limits, however, the Logistics Section was not staffed adequately to respond to the surge in demand for logistics support. One of the shortfalls encountered was the unorganized delivery of food and water to responders scattered throughout the city.[123]

Critical Transportation Capability

Public bus service was cancelled on Wednesday, 27 June without proper public notice. Residents were waiting at bus stops unaware of the decision. The local paratransit service provided by Mobile Mobility was diverted to help those with disabilities in areas threatened by the fire. Although this action had good intentions to safeguard those in potential harm's way, no notification of the change was made to regular riders with disabilities. Additionally, transportation provided by Mobile Mobility for evacuation purposes was not enough to manage the entire population in need of special arrangements. Some additional vehicles that were provided to move people with disabilities were not properly outfitted for special accessibility needs.[124]

Environmental Response/Health and Safety Capability

American Medical Response, Colorado Spring's emergency transportation provider, began medically screening each off-going law enforcement officer when the fire entered the City on 26 June.[125] Additionally, officers documented work conditions after each shift as required by the City.[126]

First responders' strong background and training on personal protection was the key factor in an excellent safety performance free of major injuries in the wildfire's unforgiving environment. Responders knew how to report hazards and mitigate them.[127]

Colorado Springs had a ready supply of Personal Protective Equipment, particularly masks, of sufficient quantity. The City distributed masks to several locations throughout the incident area, but did not clearly direct response personnel to those locations. Responders eventually expended the stocks of masks, which were not replenished.[128]

Colorado Springs response personnel endured prolonged work shifts, were

recalled during off-duty periods, lacked adequate rest, and may have suffered from

psychological stress. A shortage of personnel to direct residents during the mass

evacuation on 26 June caused the City to rely on untrained employees as well as

exceedingly lean on the trained personnel.[129] A well-calculated duty schedule was not in

place or planned for and two key safety positions were not filled in the ICS structure. The

Incident Safety Officer and the Accountability Officer positions, typically depended on to

implement and track safety systems and to designate oversight responsibility for response

teams respectively, went unfilled.[130] While behavioral health specialists and City

chaplains were made available to the public upon re-entry to the disaster area, a post-

incident behavioral health debrief was not conducted for responders who may have

suffered emotionally.[131]

Fatality Management Services Capability

Data was not available in the study's referenced sources.

Infrastructure Systems Capability

Data was not available in the study's referenced sources.

Mass Care Services Capability

Sheltering procedures executed by multiple organizations for both residents and

their pets proved to be well-coordinated, flexible, and timely. Just three hours after the

confirmation of a wildfire, activation procedures began to establish an ARC shelter at

Cheyenne Mountain High School (CMHS) with the Medical Reserve Corps of El Paso

County.[132] The Medical Reserve Corps is a group of nearly two hundred volunteer

physicians united with Colorado Springs' emergency management structure that provides medical and behavioral health support to the community.[133] Although the shelters were a success overall, they did not meet all of the needs of people with disabilities. Some examples included ramps that were blocked, inaccessible food service, child areas, and showers, and absence of accessible cots.[134]

The Colorado Springs Community Animal Response Team co-located at CMHS to care for companion pets. The CMHS shelter, therefore, was postured to provide care to all walks of life, including those with disabilities.[135] The El Paso County Animal Response Team activated the Penrose Equestrian Center as a large animal shelter, while the Humane Society of Pikes Peak Region (HSPPR) welcomed all types and sizes of animals.[136]

Mass Search and Rescue Operations Capability

First responders exhibited exemplary collaboration and focus on saving lives and protecting property and critical infrastructure. This can be attributed to capable leadership and the application of pre-incident training and lessons learned from the June 2002 Hayman Fire in the Rocky Mountains.[137]

Two and half days after the mandatory evacuation, Colorado Springs authorized HSPPR to enter the evacuated zone to search for remaining pets. Several pets were rescued and brought to their owners two days prior to the City authorizing the population to return to their homes, which brought comfort and normalcy to many residents.[138]

<u>On-Scene Security and Protection Capability</u>

Response teams recognized early that the fire was attacking from all directions, threatening life and property. The Type 1 IMT leveraged the inherent flexibility of the ICS to form a branch focused on structure protection in Colorado Springs. The prescribed strategy to remove people from the area and contain the fire as quickly as possible was successful.[139]

Despite CSPD conducting day-and-night roving patrols in and around evacuated areas, overemphasis on perimeter security shortchanged protection procedures inside the evacuated zones. Consequently, the area incurred several home and vehicle burglaries.[140]

Chaplains from CSFD and CSPD, behavioral health specialists, police officers, and firefighters provided continuous support to the population the day the City authorized re-entry into residential neighborhoods. The officials conveyed warnings of potential hazards, handed out trash bags, snacks, water, and offered mental health assistance, all which provided a sense of security and consolation while the area remained unsteady with utilities turned off, scattered smoldering ash and debris, and an ominous backdrop of fire to their west.[141]

<u>Operational Communications Capability</u>

Communications were problematic during the Waldo Canyon wildfire response. Federal and local officials were forced to overcome a significant gap in communications. The federal radio communications network was not compatible with the 800 MHz system used by the city and county. This communications obstacle hindered the ability to monitor the status of resources in the dangerous and dynamic disaster area.[142] Lack of cellular and radio connectivity at Holmes Middle School where the Type I IMT was

located created too big of a communications gap to maintain the IMT at that site, forcing

relocation. Even a portable cellular tower, called Cellular on Wheels, could not overcome

the dead spot for all phone service providers.[143]

Communications across state and local jurisdictions, however, was largely

successful since the City of Colorado Springs is a member of the Pikes Peak Regional

Communications Network (PPRCN). The Network is linked in with the Colorado

Statewide Digital Trunked Radio System (DTRS), which provides a uniform

communications network statewide. Experiencing few disturbances, PPRCN proved to be

extremely reliable. Colorado Springs responders participated in a multijurisdictional

working group in the two years prior to the fire, which enhanced interoperability. The

DTRS enabled Colorado Springs to request extra portable radios from the State and

integrate them into the response within one operational period.[144] Other agencies and

jurisdictions were slightly hindered due to the use of different radio channels.[145]

The Communications Unit Leader (COML) position was not staffed throughout

the response. When the position was vacant, connectivity and equipment maintenance

suffered. The vacancies were attributed to the lack of a formal communications plan and

shortage of trained personnel with COML competencies. An incident-wide plan might

have included protocol to update City employees regularly, an area that was overlooked

during the response. Furthermore, phone calls often went unanswered at the EOC because

phones either were not always monitored or were not programmed to ring on other

lines.[146]

The Pikes Peak Amateur Radio Emergency Service, an organized group of

volunteers trained in amateur radio operations (i.e. HAM), provided situational awareness

updates to the EOC from designated shelters protecting residents.[147] These volunteers

were ready when called upon to watch over two shelters rapidly established to

accommodate a surge of evacuees.[148]

Several ICs and OSCs credited the Dutch Creek Protocol with facilitating

informed, diligent decision-making.[149] Dutch Creek Protocol refers to a set of nine

critical communication elements for responders to follow during emergency medical

response and lifesaving operations.[150]

Public and Private Services and Resources Capability

Volunteer and donation management, although not perfect, was managed

effectively. Discover Goodwill, www.helpcoloradonow.org, Salvation Army, and Care

and Share primarily led the efforts. Beginning the third day of an ongoing imminent

warning of extreme fire, Colorado Springs activated agreements with these organizations

to collect non-perishable food and distribute the donations to first responders. At times,

volunteers arrived unexpectedly and strained the volunteer assignment processes.

Although the volunteer operation could have been better planned as noted earlier, it did

not prove to be insurmountable.[151]

A pervasive reluctance to leverage resources such as neighboring jurisdictions'

fire engines and contract services curtailed the firefighting capacity of the response.

Available firefighting assets went unused.[152]

Public Health and Medical Services Capability

The capacity of the local healthcare system was tested because the Mount Saint

Francis Nursing Home, a large facility, had to re-locate residents and patients to avoid the

fire. Emergency vehicles and practitioners, who otherwise would have been available to assist with victims, were consumed by the nursing home evacuation to a local hospital. Nevertheless, the relocation process was preplanned and exercised, and the EOC, with help from AMR, began coordination with the facility as soon as evacuation became a possibility. Another initiative that helped relieve the demand on area hospitals was assigning medical and behavior health professionals to each of the three shelters. Each shelter was successful in acquiring all necessary pharmaceuticals and medical supplies from EMResource, a Web-based database that tracks hospital bed availability and medical resources.[153]

Situational Assessment Capability

Forest Service employees improved situational awareness and better understood the risks of the operation by exercising the Wildland Fire Decision Support System (WFDSS).[154] The WFDSS is a web-based application that integrates multiple near real-time data sources from the incident, models the fire's behavior, and generates reports that document decision-making.[155] Although operating WFDSS can be a prolonged activity, its value to the decision maker is widely recognized. The Forest Service provided an independent support team at the onset of the response to run the program and generate baseline information. As the response progressed, the team's product became even more comprehensive and advantageous.[156]

City of Colorado Springs GIS employees created useful tracking tools to display fire progression and evacuation zones in the City's EOC. Maps printed on plotter paper kept EOC workers aware of the current situation, and email-friendly versions of the maps were shared with responders throughout the region.[157]

Profile of Destruction Area

The storm affected the entire East Coast; but since the majority of devastation

occurred in New York and New Jersey, the following analysis centers on that region,

particularly New York City (NYC). In 2011, the two states were home to nine percent of

the U.S. population and responsible for over ten percent of the U.S. gross domestic

product (GDP).[158] Here are the population totals for some of the New York counties,

displayed in figure 5, discussed in this study: (1) Kings; over 2.5 million, (2) Nassau;

over 1.3 million, (3) New York; over 1.6 million, (4) Queens; over 2.2 million, and

(5) Richmond; over 470,400. Other prominent locations mentioned in this study and

corresponding counties include: (1) Staten Island; Richmond County, (2) the Rockaways;

Queens, and (3) Manhattan; New York.[159] New York State's high population is racially

and ethnically diverse.[160] In reference to NYC residents' reliance on public

transportation, over 55 percent of NYC households do not have a car.[161]

Incident Summary and Impact

Hurricane Sandy made landfall as a Category 1 hurricane at nearly 80 miles per

hour on 29 October 2012 at 7:30 p.m. in the vicinity of Brigantine, New Jersey, with its

tropical force winds covering one thousand miles. Figure 6 displays the storm's path and

wind patterns. Extreme northeasterly winds generated from the severe pressure difference

between the cyclone and the Northeast dealt unrivaled storm surges to New Jersey and

New York.[162] Mandatory evacuations were ordered for 375,000 residents in NYC's high-

risk coastal zone.[163] Within two days, approximately 8 million people had no power,

20,000 people were in shelters, and AMR was tracking numerous fatalities. Of the deaths

reported to AMR, the New York and New Jersey fatality count was 53 and 34 respectively. The most common cause of death was drowning in flooded homes.[164] All of Lower Manhattan flooded, and the mass transit system shut down for one week.[165] In addition to nearly 10,000 FEMA employees who deployed, USACE sent close to 4,000 workers to unwater tunnels and clear debris.[166] A U.S. Coast Guard cutter served as an offshore command center, while three U.S. Navy amphibious ships with embarked marines arrived to support infrastructure restoration and dewatering efforts.[167] Countless other federal agencies and military service members arrived on scene to provide healthcare, distribute food, fuel, and supplies, remove debris, manage donations, and carry out other essential tasks.[168] The police and fire departments surged their workforces and conducted numerous search and rescue operations.[169]
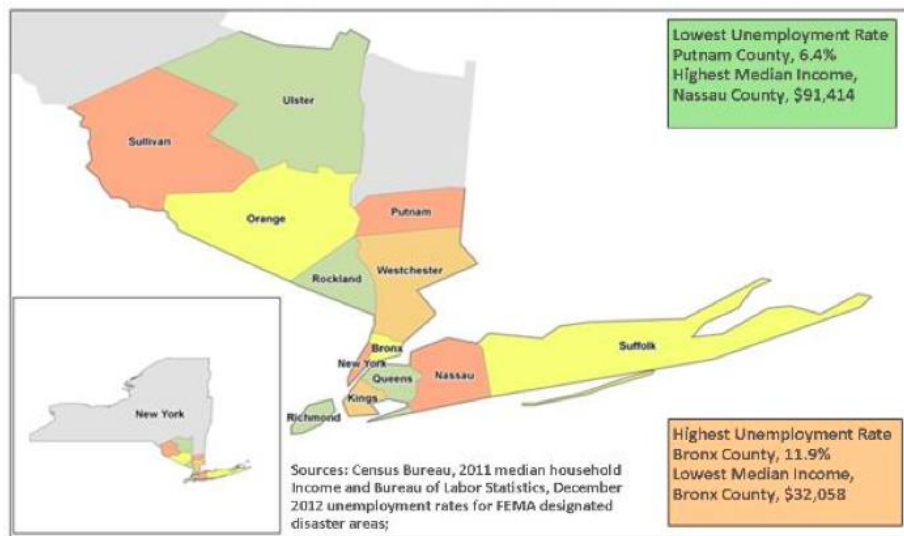
Figure 5.   New York Counties Affected by Hurricane Sandy

Source: Office of the Chief Economist, Economic and Statistics Administration, "County Summary Report of Areas in New Jersey and New York Affected by Hurricane Sandy: Baseline Demographic and Economic Conditions Prior to the Storm," Department of Commerce, http://www.esa.doc.gov/sites/default/files/reports/documents/ newfinalsandyfinalreport062613.pdf (accessed 23 May 2014), 93.
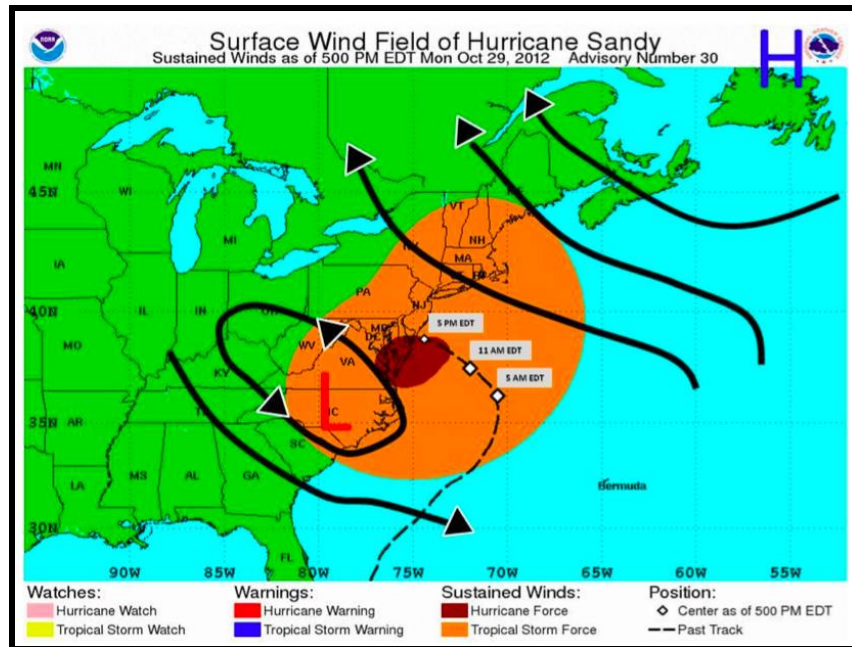
Figure 6.   Depiction of National Hurricane Center Advisory #30 and Wind Pattern

Source: National Weather Service, "Service Assessment: Hurricane/Post-Tropical Cyclone Sandy, October 22-29, 2012," http://www.nws.noaa.gov/os/assessments/pdfs/Sandy13.pdf (accessed 23 May 2014), 12.

Primary Sources Conveying Disaster Response Results

The FEMA Sandy Analysis Team published *Hurricane Sandy: FEMA After-Action Report* on 1 July 2013. The 44-page report uncovers strengths and limitations of FEMA across four broad themes as exhibited in the Sandy response: (1) ensuring unity of effort across the federal response, (2) being survivor-centric, (3) fostering unity of effort across the whole community, and (4) developing an agile, professional emergency management workforce. With a focus on whole community, the report's findings relate mostly to the operational coordination core capability. The report also gave considerable attention to the following response core capabilities: (1) planning. (2) public information and warning, and (3) infrastructure systems. The FEMA Sandy Analysis Team conducted

comprehensive research that involved developing a chronology of response and recovery actions, examining data sets, reviewing supplemental lessons learned reports, interviewing emergency responders from all levels of the government, and analyzing survey results from surge personnel.[170]

The New York City Mayor's office produced *Hurricane Sandy After Action*, dated May 2013, to report on the status of the City's response capacity during and immediately following the storm and to provide recommendations for improvement. The 67-page report's 59 recommendations are a result of a series of debriefings with more than 115 city employees from 25 agencies, anonymous surveys of 330 city responders whose day-to-day jobs did not involve emergency management, New York City Council hearings, and cooperative feedback from state agencies, the private sector, non-profit organizations, and community groups. The report's recommendations span the following themes: (1) evacuation procedures, (2) information sharing for immobile or non-English speaking individuals, (3) interoperability and integration of the City's situational awareness data systems, (4) resources for restoration of large buildings, (5) coordination of relief efforts into afflicted areas with vulnerable populations, (6) housing plans for displaced residents, and (7) relationships with government regulatory authorities of essential utility services.[171]

The oral history interview with Brian Ebert centered on his experiences and observations while supporting the Hurricane Sandy response from 1-15 November 2012. Ebert was responsible for processing requests for assistance (RFAs) for DOD capabilities in support of lead federal agencies. Processing RFAs includes anticipating emerging requirements and identifying capability gaps. This implies developing situational

awareness and understanding, generating information requirements, recommending courses of action and acceptable end states, and establishing measures of effectiveness (MOEs) for the DCO.[172]

2012 Hurricane Sandy Results

<u>Planning Capability</u>

Upon alert of Sandy's probable path of destruction, the Fire Department of New York (FDNY) and NYC Police Department (NYPD) restructured their work shifts and augmented their workforce with EMS responders. They prepositioned water rescue crews and equipment in Staten Island, Brooklyn, and Queens—actions that led to more than 2,200 rescues.[173] Standard protocol calls for NYPD to maintain their own fuel supply, which proved helpful in filling tanks of emergency vehicles and other city vehicles prior to the storm's arrival.[174]

Planning efforts of FEMA were not implemented as effectively in some regions compared to others. Officials executed a successful Incident Action Plan in Nassau County, New York, by leveraging existing guidance from the *Comprehensive Preparedness Guide 101.* A survey of FEMA personnel holding on-scene planning roles conveyed that 64 percent of them did not reference pre-established, regional hurricane plans. This was either by choice or because the plans were unavailable. Crisis action plans designed to fuse the full spectrum of community planners lacked the necessary fidelity because the different command elements such as NRCC and JFOs remained self reliant and did not consistently include community planners in their process. In broad terms, senior FEMA officials did not provide sufficiently specific guidance to enable FEMA planners to create proper planning products. Agency planners did, however,

leverage pre-incident Federal plans to create a tailored National Support Plan that proved to be effective in integrating activities at the NRCC.[175]

Planning deficiencies can be partially explained by rapid turnover of personnel and FEMA's ineffective allocation of personnel. Inefficient use of available, qualified individuals, and high turnover in the early stages of the response created unnecessary jockeying between job assignments. This organizational shuffling stymied relationships across the ranks. Figure 7 shows the frequency of senior personnel changeover at the New York JFO during the first two weeks of the response. For example, one FEMA division supervisor position changed out four times in four days.[176]

In 2012, FEMA began a workforce transformation with a focus on enhancing professionalism, training, and deployability. Sandy arrived amid this transformation, and FEMA directed numerous unqualified and unprepared employees to deploy for the response. This left many FEMA staffs short-handed of needed personnel competencies. Thirty percent of deployed FEMA personnel did not hold a FEMA Qualification System (FQS) title, while nearly the same percentage of FQS credentialed employees assumed responsibilities outside of their qualifications. Nearly all of FEMA's permanent workforce and reservists who were available deployed, either to Sandy or other disasters. The Agency's ability to mobilize a prodigious workforce for a major disaster nearly resembling the extent of a catastrophic incident proved to be untenable, even though considerable progress had been made since Hurricane Katrina.[177]

The Post-Katrina Act charged DHS with establishing a surge workforce to augment FEMA's full-time employees in the event of large-scale incidents. The Department established the Surge Capacity Force (SCF) comprised of DHS employees

who volunteer to train and deploy in the fields of logistics, community relations, and financial assistance. The SCF proved to be a valuable resource both in their trained fields and in special projects. For instance, 130 SCF members augmented the New York JFO and identified more than 3,000 afflicted survivors by making over 19,000 phone calls.[178]
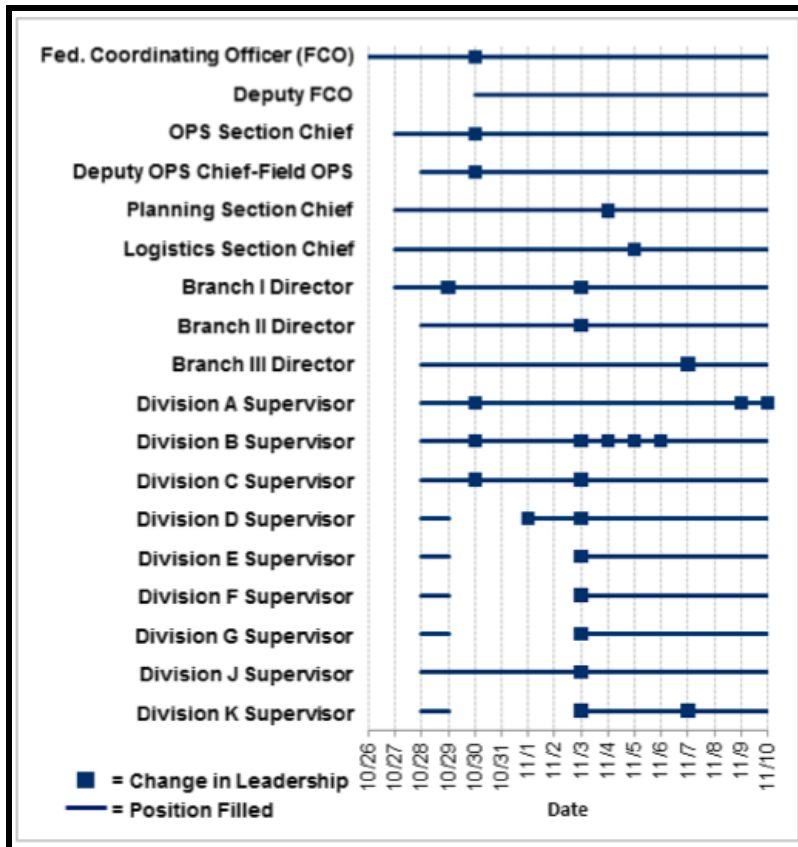

Figure 7.   Turnover of senior FEMA officials at the New York JFO

Source: Federal Management Agency, *Hurricane Sandy: FEMA After-Action Report* (Washington, DC: Government Printing Office, 2013), 14.

Public Information Capability

The NYC Mayor's press office served as the principle authority to release urgent and consistent information to city residents. The City shared information via all available

means, including television, radio, NYC.gov, Mike Bloomberg YouTube channels, and City Twitter posts. Communication methods catered to more than one hundred ethnic and specific community outlets in different media formats, including multinational newspapers, foreign language radio transmissions, and television broadcasts with sign language interpreters. The City responded to 311 public inquiries—as many as 274,000 calls in a single day—rapidly if not immediately. The City exercised its own emergency alert system, Notify NYC, and the Federal Communication Commission's (FCC) new alert system, Commercial Mobile Alert System (CMAS), to reach citizens. Notify NYC contacted 165,000 users via landline, cell phone, text message, email, and Twitter, while CMAS alerted all activated cell phones in the region.[179] Although *New York City After Action* seems to boast about Notify NYC's effectiveness, NYC perhaps did not promote the alert system enough to reach a larger portion of its eight million residents. The City did have backup, hardcopy pamphlets ready when storm affects hindered telephone and electronic communications and distributed them to stricken neighborhoods.[180]

A "Check Your Home" mobile application and web portal were created by FEMA so survivors could view aerial imagery of their inaccessible homes. The New Jersey OEM promoted the site on social media websites. Survivors simply had to type in their address in the application to observe their property, a service widely praised after the storm.[181]

A multifunctional Innovation Team established by FEMA comprised of a cross-section of public, private, and volunteer organizations to creatively assist survivors. In support of public information dissemination, the Team shared language-specific radio frequencies and media channels with non-English speaking neighborhoods to improve

community messaging. The Team also established a social media presence where they demystified anecdotal reports after extensive investigative research.[182]

Multiple organizations developed smartphone applications to share critical information that proved to be a widely leveraged resource for survivors and responders. Over 100,000 users downloaded the ARC's hurricane application to track the hurricane, anticipate effects, and identify nearby shelters. More than 50,000 users downloaded FEMA's Emergency Preparedness application, which provided checklists, maps, shelter information, and applications for assistance.[183]

Operational Coordination Capability

Governors made their requests for major disaster declarations verbally to the President. The President issued swift declarations. This expedited execution overcame bureaucratic friction.[184]

Coordination between senior federal and state officials did not follow a structured process, which blurred interpretations of key decisions and messages. State and local governments did not understand the eligibility terms of the President's 100 percent cost share authorization for power restoration and emergency public transportation assistance. Mechanisms were not in place to explain newly implemented policies to those expected to execute them. The confusion deterred state, local, and tribal officials from requesting certain types of assistance such as decontamination support at the Newark Waste Treatment Plant. Additionally, federal officials did not always inform the NRCC of support efforts they initiated for the states. The *Hurricane Sandy FEMA After-Action Report* points out the NRF does not offer guidance to establish standardized mechanisms for senior officials to communicate with each other or with operations centers.[185]

Area Coordination Groups were created by FEMA to liaise between FCOs and senior state and local officials. This freed up FCOs in New York and New Jersey to focus on execution of operations rather than informational briefings. Although this new concept showed benefits in terms of streaming information to Washington, it was foreign to most senior federal officials and created confusion as to who could obligate resources within FEMA.[186]

The combined organization construct FEMA implemented was largely successful in establishing linkages with local communities. The construct assigned personnel based on functional specialties and geographic zones, a standard approach for major disasters as outlined in FEMA's *Incident Management Handbook*. Local officials praised FEMA liaisons and Division Supervisors for corralling federal response assistance expeditiously to meet their community's needs. However, they were not completely satisfied with their understanding of who within FEMA had authority to obligate resources. Lines of responsibility remained unclear in the eyes of FEMA employees and caused some tension between LNOs and Division Supervisors.[187]

A Unified Coordination Group (UCG) was established by FEMA during Sandy, as the NRF advises. The UCG is an organizational construct coordinated jointly by the FCO and SCO to integrate federal and state actions. The austere impacts of Sandy, however, overburdened established community and jurisdictional linkages and led to a breakdown in coordination and situational awareness. Local officials were not adequately involved with the UCG, and city and state federal resource requests were not harmonized. For example, USACE received conflicting tunnel pumping instructions from NYC and New York State, which muddled USACE's understanding of priorities.[188]

While deployed to Maryland and prior to leaving for New York, Brian Ebert recalled a situation where the State Operations Officer came to him for an urgent RFA to evacuate approximately 400 residents trapped in a coastal town where the bridge to the mainland was inaccessible due to flooding. He made the connection that the State was not coordinating with the Maryland National Guard, so he steered the State in that direction. Ultimately, the National Guard had the right assets to solve the problem. Ebert observed that in both Maryland and in New York, the States were so consumed by the response that they often disregarded accessible assets within their own jurisdiction.[189]

The command and control structure in the federal military response confused many military officials. Unclear relationships between the dual-status commander, joint coordinating element, and DCO impaired unity of effort and burdened the force allocation process.[190]

Seven of ten DCEs deployed for Sandy within the states of Virginia, Maryland, New Jersey, and New York. It was rare for multiple DCEs to be operating within the same area and reporting to one DCO. In DCE VII's case, they were reporting to the DCO from Region II who was overseeing the five boroughs for DOD. Typically, DCOs and their respective DCEs are assigned separate and distinct areas from other DCO and DCE pairings. For the Sandy response, information sharing protocol between DCEs, the Navy's amphibious ships, the Marine Corps' 26th Marine Expeditionary Unit (MEU), Joint Task Force Civil Support, and National Guards was never promulgated. The challenges created by the lack of clarity of DOD communication pathways cascaded to FEMA and the states as well.[191]

The Federal Emergency Management Agency divided into four branches led by Branch Directors: (1) Suffolk and Nassau Counties, (2) five boroughs of New York City, (3) Westchester County, Yonkers, and the West Point area, and (4) the remainder of New York State. Traditional procedures called for each of the four FEMA regions to filter information, including reports from DCEs within each region, directly to the President-appointed FCO, Michael Byrne. This did not materialize in practice, however. Byrne's team sought information directly from DCE VII due to former, established relationships, which led to multiple sources, including DCE II, reporting information to Byrne from the same geographic area without any crosstalk. The DCEs eventually resolved this impediment amongst themselves after three or four days of confusion.[192]

The greatest challenge Brian Ebert faced during the Sandy response was the integration of the 26th MEU into operations ashore in Staten Island and southern Queens. The media broadcasted footage of marines helping citizens in their homes and relocating debris before the DCE was aware of the MEU's presence, and the concern was that a requirement was never articulated through proper channels. Although the Navy and Marine Corps provided invaluable relief in the aftermath of Sandy, this example highlighted one instance of a lack of coordination within the military and between the military and civil authorities.[193] Further information about the integration of the 26th MEU into the response can be found in *Marine Corps Support to Hurricane Sandy Relief Efforts*, published 4 April 2013 by the Marine Corps Center for Lessons Learned.

Critical Transportation Capability

Massive flooding of train and subway tunnels halted New York City's rail transportation south of 34th Street as of 1 November. The Army Corps worked alongside

the City's Department of Environmental Protection (DEP) and provided vital pumping capabilities to dewater the tunnels, and after one week, the New York Metropolitan Transit Authority ran at 80 percent service capacity.[194] Although this response seemed to be acceptable from all accounts, the absence of public transportation for at least one week led to paralyzing traffic congestion and hindered emergency vehicle access. The City and State adequately overcame these challenges by instituting a fuel rationing system, activating high-occupancy vehicle (HOV) lanes, and running provisional ferry service from the Rockaways and Staten Island to Lower Manhattan.[195] The President authorized 100 percent federal reimbursement for emergency transportation needs, which helped mitigate the lost rail capability to New York and New Jersey with bus service.[196]

The storm surge caused damage to LaGuardia Airport landing lights located on nearby islands to the north of the airport. Defense Coordinating Element VII quickly coordinated 2 CH-53 Sea Stallion Marine Corps helicopters to transport 50-kilowatt generators and other necessary equipment to restore illumination.[197]

Ebert recalled the New York and NYC executed transportation plans as written and practiced. Mayor Bloomberg shut down the City's public transportation system 12 hours before the storm's arrival. Ebert recounted that many residents in the Rockaways did not want to leave in fear they would lose their jobs. With a high percentage of residents relying on public transit as their sole means of mobility, there were few options available to facilitate an eleventh-hour evacuation. Several residents were trapped in place.[198] It was not until 20 November, when public transportation was again made available to the Rockaway Peninsula. The Metropolitan Transit Authority began running

free shuttle bus connectors to circumvent the damaged rail between the Rockaways and Queens.[199]

The storm surge incapacitated the region's main fuel storage facility in Bayonne, New Jersey. The terminal and pumps were under water, so fuel could not be extracted and sent to necessary areas to fuel vehicles and heat homes.[200] Except for the Rockaways, most of NYC's retail gas stations were unscathed; however, they could not receive fuel shipments because the supply chain infrastructure was damaged. The Mayor's Office of Long-Term Planning and Sustainability released a daily gas availability report using data from GasBuddy.com to help residents and private industry find gas stations with fuel for transportation and power needs. The police department's fuel stockpile for city emergency vehicles needed to be supplemented by 4 November, so they turned to the National Guard, the U.S. Defense Logistics Agency, the U.S. Department of Energy (DOE), and the National Park Service to establish temporary fueling facilities at Floyd Bennett Field (Brooklyn), Fort Wadsworth (Staten Island), and Orchard Beach (Bronx). This operation fueled over 25,000 vehicles providing essential response capability. The City also established a partnership with ten Hess stations for private ambulances to fuel, while the State eased sulfur content restrictions.[201] Additionally, DHS facilitated expedited delivery of oil by waiving the Jones Act from 2-13 November, which allowed foreign registered vessels to deliver oil from refineries in the Gulf of Mexico directly to the Northeast without having to first sail to a foreign port.[202]

New York City police officers stood watch over numerous traffic intersections with broken or powerless signals, but did not have enough officers to cover all of the 3,500 intersections. The police department called into action 1,200 recruits for traffic

management duties. The fire department cleared over 3,250 trees, beach sand, and other debris from streets, clearing access for search and rescue efforts.[203]

The Debris Removal Task Force (DRTF), comprised of NYC agencies, USACE, and contractors, cleared rights-of-way and homes of thousands of tons of debris and downed trees. This major, nonstop operation greatly enabled response and recovery actions to be executed.[204]

Environmental Response/Health and Safety Capability

Upon receipt of new storm surge warnings from NWS, Mayor Bloomberg ordered a mandatory evacuation of the NYC's coastline and low altitude areas on 28 October. These areas to be evacuated collectively defined the NYC Coastal Storm Plan's Evacuation Zone A, 1 of 3 zones covering 375,000 residents that included newly added areas after Hurricane Irene in 2011.[205] The NYC Housing Authority partnered with NYPD to deliver 200 buses and infuse a sense of urgency to Zone A. City officials armed with megaphones reverberated evacuation warnings from flashing police cruisers and handed out ready meals and supply kits until the final moments before the storm's landfall.[206] Most residents cooperated, but still 43 people died in Zone A after choosing not to evacuate.[207] The NYC OEM administered a post-storm survey to 509 Zone A residents about their evacuation actions. Among the survey participants, 22 percent believed the storm would not jeopardize their safety while 11 percent believed their home was elevated enough to avoid flooding.[208] The City's 911 system reached its highest call volume of 20,000 calls per hour, and was able to handle the increased capacity.[209]

New York State health officials carefully and diligently compared the risks of evacuating hospitals and other health care facilities with the risks of continuing care in

place in the midst of the storm. Lessons learned from Irene, where NYC executed a fatality-free general hospital evacuation, highlighted several vulnerabilities posed by an across-the-board hospital evacuation. Accordingly, as Sandy bore down on NYC, the City directed hospitals in Zone A to discharge only those patients who could safely endure the storm, and to maintain care of all other patients on station.[210] For such extremely dire situations, State regulations require health care facilities in low-lying areas be designed with backup electrical, power, and water supplies, emergency communications infrastructure, alternate waste facilities, and other capabilities that can withstand floods up to the "one-hundred year flood crest level," which is 12.35 feet.[211] The inherent durability of the facilities, however, did not withstand the floods. Five hospitals lost power and safely evacuated all patients to alternate locations.[212]

In the 8 days after the storm, 6,000 sanitation workers removed nearly 110,000 tons of debris, while DEP verified debris samples were asbestos-free. The DRTF moved the debris to seven pre-designated storage sites licensed by the New York State Department of Environmental Conservation.[213] The NYC fire department dewatered more than 2,700 flooded homes and businesses, reducing the hazardous conditions and clearing access for search and rescue operations.[214]

Fatality Management Services Capability

Data was not available in the study's referenced sources.

Infrastructure Systems Capability

More than 1.5 million people in NYC, many in the Lower East Side of Manhattan, lost power after the storm surge because Con Edison and Long Island Power

Authority (LIPA) infrastructure was damaged. The storm surge penetrated the Battery at 14 feet, rising above the 11 to 12 foot barriers Con Edison erected based on NWS predictions. Flooded infrastructure included the 13th Street Con Edison substation and four LIPA substations. Downed power lines caused 70 percent of customers in the Bronx, Brooklyn, Queens, and Staten Island to lose power. Residents in the Rockaways, Coney Island, and other coastal areas experienced a blackout as well.[215]

New York City began deploying generators to vital buildings soon after the blackout on the evening of 29 October. It is a matter of routine for NYC and USACE to cooperatively survey facilities that provide vital lifesaving and disaster recovery needs in order to prioritize essential power generation needs prior to hurricane season. Private facilities with downed generators were also anxious for the City to restore power for their needs. As a result, the Mayor's Office of Long-Term Panning and Sustainability, NYC OEM, FEMA, and USACE partnered as an intergovernmental task force to manage the overwhelming demand for power generating resources. The City delivered around 230 generators, and the task force satisfied all urgent safety and life-sustaining needs. The City's Housing Authority contrived expedient contracts for 150 electricians to make temporary repairs to the Con Edison and LIPA power grids, which restored power to more than 79,000 residents in roughly 400 buildings over the course of 2 weeks following the storm. This power restoration evolution exposed some deficiencies to the City, which has led to internal actions to more proactively enforce laws requiring property owners to maintain building infrastructure.[216]

Four solar power companies formed teams of volunteers in New York and New Jersey and delivered ten-kilowatt mobile solar generators to devastated areas such as the

Rockaways and Staten Island. The generators supplied vital electricity to run appliances and other critical equipment that sustained basic human needs.[217]

Mass Care Services Capability

The capacity of NYC's evacuation shelter system is sufficient for any likely disaster the area may face. If fully activated, the City claims it can shelter up to 600,000 people with the support of its 34,000 trained City employees. One day before Sandy's landfall, the City activated the shelters necessary to support the 71,000 people affected by the Zone A evacuation. This allowed residents to use the subway and city buses to reach the shelters before the City had to stop public transportation. Only 6,800 people initially sought shelter, the majority of whom did so soon after the storm's departure. The City's shelter system is comprised of mostly public school buildings in accessible areas outside of coastal flood zones and 5,700 pallets of emergency food and supplies. The system is designed to sustain people seeking shelter for three days, significantly less time than Sandy victims needed before returning to their homes due to flooding and power outages. For subsequent surges of people seeking shelter, the City made additional facilities available on 12 November, including leased hotel rooms.[218]

The Federal Emergency Management Agency instituted the Transitional Sheltering Assistance program that moved over 11,000 displaced victims from shelters to commercial lodging while adequate quarters were being arranged.[219] The Agency also established the Sheltering and Temporary Essential Power program that provided rapid, essential services to survivors and led to 18,700 repairs in New York. These essential services included (1) repair of broken electrical meters preventing power companies from continuing service, (2) delivery of temporary essential services such as hot water,

electricity, and heat, and (3) basic external repair to damaged homes. These services shored up damaged homes and restored basic human needs, enabling victims to remain at their residences without needing to be temporarily relocated.[220]

New York City implemented creative ideas to place survivors in provisional housing. For example, the City partnered with a social media rental website, Airbnb, that matched displaced victims with participating landlords offering vacant properties as temporary shelter. Over 1,400 people opened homes to 4,000 displaced individuals through use of the website.[221]

Significant contributions to mass care services were provided by ARC and the Salvation Army. The evening the storm made landfall, ARC sheltered 10,928 residents in 258 shelters. In the immediate aftermath of the storm, the Salvation Army orchestrated mass distribution of food, blankets, baby supplies, toiletries, batteries, and flashlights.[222]

The Federal Emergency Management Agency sought assistance from Ebert to acquire tents for disaster recovery centers that could shelter approximately 200 survivors, serve meals, and provide for other basic human needs that were highest in demand in the Rockaways and on Staten Island. Several civilian and military organizations were ready and equipped to provide the necessary resources to meet this mass care requirement upon verbal request, including the U.S. Defense Logistics Agency at their Philadelphia depot and the Marine Corps positioned at Joint Base McGuire-Dix-Lakehurst. The challenge for Ebert was determining the right organization at the right level for the job. Ultimately, he determined the State already had the necessary resources, highlighting a critical link between operational coordination and mass care.[223]

Mass Search and Rescue Operations Capability

The NYC police and fire departments searched more than 31,000 residences and businesses in afflicted areas once weather conditions improved. Prepositioned FDNY and NYPD teams conducted mass waterborne rescues in Staten Island, Brooklyn, and Queens. Some NYPD flood rescue teams only had access to metal rowboats, which limited maneuverability in strong currents and presented electrocution risks in the event of downed power lines. Nevertheless, these teams along with better-equipped specialized units executed their lifesaving mission no holds barred.[224]

On-Scene Security and Protection Capability

The New York JFO launched the Neighborhood Task Force Initiative that deployed multi-functional teams, called Neighborhood Crews, to the most devastated areas. The Crews were tailored to meet distinct needs of diverse neighborhoods, including cultural disparities and disability challenges.[225]

Ebert said police officers were ubiquitous, seen on almost every block. He spoke with them frequently, and crime dropped during the response. He attributes this to a public recognition that everyone was suffering and to the volunteer organizations who delivered clothes and supplies. He recalls no looting or hoarding of donated goods.[226] Police officers and School Safety Agents were present at shelters to provide security and protection, but also to distribute donated food and assist with requests for FEMA assistance.[227]

The City, State, and FEMA collectively assembled 500 light towers in afflicted neighborhoods that deterred crime, facilitated nighttime rescue operations, and served as central information hubs for locals.[228]

<u>Operational Communications Capability</u>

The Innovation Team supported responders and survivors with specialized satellite communications equipment that enabled Internet connectivity. This equipment, called Very Small Aperture Terminal, freed up FEMA's Mobile Command Operating Vehicles to serve specific areas of greater need. The Team partnered with telecommunications companies and developed Voice over Internet Protocol (VoIP) telephone systems, Wi-Fi networks, and high capacity satellite terminals for responders and survivors.[229]

The National Business Emergency Operations Center (NBEOC), co-located with the NRCC, was established in 2011 to serve as the critical conduit between public and private stakeholders before, during, and after a disaster. The NBEOC facilitated valuable two-way information sharing, providing critical updates on housing and infrastructure to the private sector and affected communities. As efficient as the Center was at collecting and circulating information, though, its situational reports only reached its membership. An area for improvement that surfaced is the ability to connect with private businesses outside of the network.[230]

<u>Public and Private Services and Resources Capability</u>

Two days after the storm made landfall near Atlantic City, FEMA created an Energy Restoration Task Force to coordinate a colossal power restoration effort that ultimately involved DOD's U.S. Transportation Command airlifting 229 industrial vehicles and 487 personnel. In total, over 70,000 utility workers worked to reconstitute power.[231]

To address the substantial fuel shortages and power outage to 8.5 million customers, the U.S. DOE initially took the lead as the designated coordinating agency for ESF #12 (Energy). The Department proved to be limited in its ability to connect all of the necessary agencies and organizations. Coordinating a whole community approach to ESF #12 was too difficult a task for DOE, so DOE and FEMA formed the Energy Restoration Task Force at the direction of the President. The Task Force ultimately achieved the power and fuel restoration objectives.[232] In response to state requests, DOD delivered 9.3 million gallons of fuel to New York and New Jersey, enabling responders to operate emergency vehicles and equipment.[233]

Community Relations and Individual Assistance teams rapidly addressed federal disaster aid applications brought to their attention at town hall meetings and community events. The meetings and events were coordinated by the New York JFO as part of the Support, Execute, Record, Verify, and Evaluate (SERVE) program.[234]

A bright example of private industry partnering to provide relief to survivors involved response teams from Proctor and Gamble, the ARC, and Tide® Loads of Hope™. The teams provided showers, personal care kits, household products, baby products, and laundry service. They established a Duracell Power Forward Center in Battery Park, New York and operated a Rapid Responder 4x4 truck in damaged neighborhoods in New York and New Jersey. These Power Forward assets assisted ten thousand families by offering batteries, use of charging equipment for laptops and cell phones, and Wi-Fi connectivity free of charge.[235]

Public Health and Medical Services Capability

New York State, NYC, and other healthcare officials safely, but not always

systematically, evacuated 6,300 patients from 37 separate healthcare facilities to medical

installations with available beds or, in the worst case, to one of eight Special Medical

Needs Shelters (SMNS).[236] Doctors, other medical professionals and administrators, and

healthcare volunteers operated the SMNS, which were sponsored by NYC. Special needs

evacuees tested NYC's ability to deliver exclusive services and unique equipment. Some

patients had strict dietary requirements while others relied on ventilators. Adding to the

evacuation complexity, not all medical records and medications were available. The City

and healthcare facilities did not have established plans to move patients to alternate

establishments or across jurisdictions.[237] Some of the evacuated facilities reconstituted

when power and communication systems were restored; however, reopening them was

cumbersome because no plans were in place to guide verification of the buildings'

structural integrity, utility lines, and other services.[238]

The U.S Department of Veterans Affairs offered a smartphone application

providing instructions on psychological first aid (PFA). More than 1,800 users

downloaded the PFA application in the event they had to administer the first aid to adults,

families, or children.[239]

Situational Assessment Capability

The Federal Emergency Management Agency demonstrated a newfound

resourcefulness in its use of crisis management software. The Agency used WebEOC, an

online information management tool, at the NRCC to synchronize response activities

from the field. The program displayed snapshot-in-time dashboards providing updates on

resource orders and outstanding tasks. A majority of NRCC workers rated WebEOC as an "effective" tool underscoring an effective common operating picture. Data collection was not flawless, however.[240] The Agency did not track the status of specific capabilities revealed to be deficient during the deliberate planning process, nor did the Agency document which plans it used in the response.[241]

Six thousand volunteers across the nation formed the Humanitarian OpenStreetMap Team's MapMill project team and examined 35,000 aerial images from the National Oceanic and Atmospheric Administration (NOAA) and Civil Air Patrol to assess damages to facilities and structures primarily during the fourth, fifth, and sixth days following the storm's landfall. The team produced a color-coded overlay that Google displayed on its Sandy CrisisMap and FEMA posted on its internal portal. The tool helped prioritize area-specific response efforts based on the extent of damage.[242]

Brian Ebert recounted a story that highlights the extreme demand for information at the highest levels of government. While operating in Maryland, Ebert received a call directly from the NORTHCOM Current Operations Director (J33). The J33 Director needed to speak with Ebert again ten minutes later to capture the three geographic areas of greatest concern and anticipated requisite DOD capabilities that would be needed to respond. The reason for the quick turn-around time was the J33 Director had to brief the NORTHCOM Commander in 20 minutes, the NORTHCOM Commander had to brief the Secretary of Defense in 30 minutes, and the Secretary of Defense had to brief the President in an hour. The DCE was successful in getting an accurate answer from the State, as Ebert conveyed that no DOD forces were anticipated to be needed. Three days after the storm's passing, the DCE was directed to move to New York. Ebert credited the

accurate, rapid reply to the thorough situational assessment of the operating environment (OE) prior to deployment, which included evaluating factors such as social economic susceptibilities, geological features, vulnerable coastal areas, and transportation networks.[243] It is common practice for DCEs to conduct an analysis of the OE to gain situational understanding using eight interconnected operational variables: (1) political, (2) military, (3) economic, (4) social, (5) information, (6) infrastructure, (7) physical environment, and (8) time (PMESII-PT).[244] Ebert admits a better assessment could have, and perhaps should have been conducted on the city of Baltimore.[245]

Defense Coordinating Element VII assumed work within the five boroughs of New York City, a broad mix of approximately 13 million people and close to the size of Region VII's entire population across four states. Because DCE VII deployed to New York with little advanced notice, it did not have a firm understanding of the OE. This troubled DCE VII for the duration of the response. For example, DCE VII was not initially aware of the status of the National Guard, the Navy's three amphibious ships, the Marine Corps' 26th Marine Expeditionary Unit (MEU), nor the coordination structure between commands such as the base support installation at Joint Base McGuire-Dix-Lakehurst or the Joint Task Force Civil Support. Furthermore, because no acceptable end states (i.e. desired outcomes) were defined, it is likely that some DOD forces remained in a response posture for five to six days longer than necessary.[246]

The City of New York did not have a monitoring system in place with utility companies to collect real-time data on electricity, fuel, and telecommunications networks. This delayed gaining situational awareness of the storm's affects on these essential

services by several days. This is a limitation that requires a close partnership to be built between NYC and the utility industry.[247]

Gaining situational awareness of gasoline demand was difficult for NYC, despite evidence showing the City adapted well to the unexpected fuel challenges. The City did not have a formal fuel plan in place, and the complex, competitive nature of the fuel industry made attempts at information gathering and establishing a united effort problematic.[248]

<div align="center">Answers to Secondary Research Questions</div>

Results based on the preponderance of evidence presented in this Chapter are displayed in table 3. The secondary research questions are restated here to draw forth the study's original aims: In relation to the fourteen response core capabilities, what capability gaps and performance shortfalls were identified for each of the cases? Can common capability gaps and performance shortfalls be identified across the cases? The first question is a necessary precursor to the development of cross-case findings. Brief summaries of the individual case study findings, followed by a discussion of the cross-case results, are presented in the ensuing paragraphs.

Table 3.   Cross-case Synthesis

	Joplin Tornado	Waldo Canyon Wildfire	Hurricane Sandy	Replications
Planning	▨	X	X	
Public Information & Warning	X	X	▨	
Operational Coordination	X	X	X	X
Critical Transportation	▨	X	▨	
Environmental Response/ Health and Safety	▨	X	▨	
Fatality Management	X	N/A	N/A	
Infrastructure Systems	▨	N/A	▨	
Mass Care Services	▨	▨	▨	
Mass Search and Rescue	▨	▨	▨	
On-scene Security/ Protection	▨	▨	▨	
Operational Communications	X	X	▨	
Public/Private Services & Resources	▨	X	▨	
Public Health & Medical	▨	▨	▨	
Situational Assessment	X	▨	X	

KEY

X — Significant performance shortfall within Core Capability

▨ — Preponderance of evidence suggests core capability was delivered satisfactorily

N/A — Unable to determine performance of core capability based on findings reviewed

Source: Created by author.

The Joplin tornado response showed deficiencies in public information and warning, operational coordination, fatality management, operational communications, and situational assessment. Sufficient advanced warning broadcasts and sirens alerted

Joplin residents to an imminent tornado that hit the ground 24 minutes later. The majority of residents did not heed the warnings and waited for additional indicators, which might have been a contributing factor to the high fatality count from the disaster. The integration of an influx of volunteers was not well coordinated, as many of them commenced activities such as search and rescue operations without proper notification, equipment, or training. Deficient personnel tracking led to duplicity of effort on occasion. Contracting officers were scarce in Joplin, so procurement support came from FEMA Headquarters, which proved to be inefficient. Folding the Joplin tornado into an existing disaster declaration led to changes to the Incident Action Plan that did not clearly explain priorities and objectives. The 230 miles of separation between the JFO and JDO, and high workforce turnover caused some organizational confusion. Fatality management was a challenge in Joplin. The DMORT could not keep up with the fatalities, a victim identification error occurred, and some volunteers helping with body recovery were untrained. Intermittent email and cell phone operability at the JFO and JDO hampered operational communications. FEMA was unable to develop a COP with graphic overlays and tactical data, and information-gathering priorities were not developed at the strategic level.

The Waldo Canyon Wildfire response exposed a need to improve planning, public information and warning, operational coordination, operational communications, and public/private services and resources. Planning was shortsighted at the Waldo Canyon wildfire. Job aides reflecting emergency plans were not referenced at the EOC and work schedules were not established for response personnel. Documentation of decisions did not occur. Local organizations were unfamiliar with IMT functionality. Communication

capability and capacity shortfalls at the Holmes Middle School ICP and the JIC could have been avoided with an established equipment testing program. Volunteers were not put to optimal use due to an inefficient check-in process. Public information shortfalls included providing inadequate information for people with disabilities, not keeping pace with social media demands, and getting bogged down with situational updates to VIPs. Evacuation orders were not always clear and mass notification systems underperformed. Operational coordination suffered from a lack of preplanned agreements between jurisdictions and with the military. Colorado Springs public bus service was cancelled unannounced and inadequate transportation arrangements were made for people with disabilities. Colorado Springs response personnel overexerted themselves, not all the appropriate safety gear was available, relief workers were often untrained, and a post-incident behavioral health screening was not conducted for responders. No formal communications plan was in place, the federal radio frequencies were not compatible with city and county systems, and poor cellular connectivity at the Type I IMT depicted significant communication shortfalls. Lastly, a proactive effort to share firefighting resources was absent from the Waldo Canyon wildfire response.

The response to Hurricane Sandy underscored weaknesses in planning, operational coordination, and situational assessment. Necessary FEMA planning efforts were slow to develop because pre-established, regional hurricane plans were either unavailable or simply not referenced by a majority of FEMA employees. Once command elements were established, such as JFOs, they tended not to seek input from community planners. Planning staffs at command elements within FEMA suffered from rapid workforce turnover, which stymied relationships across the ranks. At the same time, 30

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percent of deployed FEMA personnel were unqualified for their assignments. Operational coordination during Sandy was convoluted. Federal, state, and local officials did not follow the structured reporting process of the UCG, which led to resource requests not being harmonized. A muddled military command and control structure, including active duty, reserve, and National Guard forces, impaired unity of effort. Critical information needed for situational awareness was not being shared among DOD elements, and defined end states were not understood. New York City lacked a monitoring system for essential utilities, which delayed restoration of services.

Research suggests a systematic shortfall was evident across all cases within the operational coordination core capability. Workforce turnover, integration of unqualified or untrained employees, unclear command and control relationships, insufficient use of established regional and local emergency plans, and a lack of preplanned agreements were common flaws across all three of the disaster response efforts.

Four additional response core capabilities were deficient in two of the three disaster responses: (1) planning, (2) public information & warning, (3) operational communications, and (4) situational assessment. Although there is not enough evidence to conclude these areas are systematic shortfalls across the three disaster types, trends in the results draw attention to these core capabilities as important areas for improvement. Planning weaknesses at the Waldo Canyon wildfire and Sandy response included inefficient workforce allocation and scheduling, an inability to leverage relationships and established regional plans, a lack of understanding of emergency management practices, and failure to test technology in advance. Public information shortfalls in Joplin and at the Waldo Canyon wildfire included insufficient communications with the disabled

population, an inundation of social media demands, and evacuation orders that were

unclear or not credible in residents' minds. Operational communications in Joplin and at

the Waldo Canyon wildfire underperformed mainly due to poor cell phone connectivity

and unreliable technological equipment and infrastructure. Lastly, situational assessment

was not ideally achieved in Joplin or during the Sandy response predominantly because

information-gathering priorities were not synchronized across disaster response networks.

Conclusion

Reasonable evidence exists from the individual case studies, in most instances, to

draw broad conclusions on the disaster response community's ability to deliver the core

capabilities outlined in the NRF for each major disaster. While 9 of the 14 core

capabilities showed signs of needing significant improvement in at least one of the

disasters, only 1 core capability—operational coordination—exposed itself as a

transcending shortfall or "replication" across all 3 disasters. Delivery of mass care

services, mass search and rescue, on-scene security and protection, and public health and

medical capabilities proved to be universally successful. The multiple case study results

confirm the thesis that the NRF was moderately successful in guiding the delivery of

response core capabilities in recent major disasters.

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CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Introduction

The purpose of this research was to determine how the NRF performed in guiding emergency response actions in recent major natural disasters. Research included a multiple case study of the Joplin tornado (2011), Waldo Canyon wildfire (2012), and Hurricane Sandy (2012). The study assumed these major natural disasters are illustrations of the locations and types of disasters the U.S. will likely face in the foreseeable future. The 14 response core capabilities defined in the NRF served as the common criteria to assess the performance of the NRF during the response to the 3 major disasters. Analyzing evidence from multiple published documents and oral history interviews provided the rigor necessary to validate findings. This multiple case study sought to link analogous results from all cases to pervasive shortfalls systematic to the nation's disaster response network in order to provide focus for future improvements. The recommendations in this chapter do not collectively provide a recipe for a new response framework or plan; rather, the recommendations are a starting point to make subtle, yet influential adjustments to the current NRF.

Answer to the Primary Research Question

How has the NRF performed in guiding emergency response actions in major natural disasters? Recent disaster response efforts indicate the NRF guided the disaster response community moderately well in the delivery of response core capabilities. This multiple case study assessed each of the 14 response core capability during 3 incidents,

resulting in 42 data observations. Of these 42 data observations, a majority (24) of the capabilities were delivered successfully and without a significant shortfall. Although the 18 other observations had significant performance gaps, the associated core capability was executed, on most occasions, to ultimately meet mission needs; however, delivery of the capability likely did not meet the government's own expectations or the expectations of residents or the private sector. After-action reports and lessons-learned studies following the Joplin tornado, Waldo Canyon wildfire, and Hurricane Sandy were far more favorable than those written in the wake of Hurricane Katrina, but current response guidance is not perfect. The NRF has fallen short in guiding the nation to deliver a satisfactory level of operational coordination.

The last few decades demonstrated that improving national response doctrine is an evolutionary process. Subsequent to the disaster responses studied in this thesis, several steps have been taken to make another round of improvements since the implementation of the 2008 NRF. Some of the examples include: (1) FEMA updated its *Incident Management Handbook* in January 2013 to improve command relationships across the government, (2) NYC restructured Hurricane Evacuation Zones into 6 zones to include 600,000 more residents and committed $30 million over the next 2 years to improving emergency notification infrastructure, (3) NIFC implemented streamlined coordination procedures, (4) U.S. Forest Service launched an acquisition program to double its large airtanker fleet, and (5) FEMA launched a nation-wide project to develop a regional all-hazards plan (RAHP) in each FEMA region that will provide detailed strategies to execute a federal response to a catastrophic incident.[1]

Recommendations: National Response Framework

State politicians, emergency managers, and responders need a better understanding of federal capabilities and processes. A handy reference outlining involved organizations, key players, available assets, financial outcomes, and legal considerations would be a valuable tool. Communities across the nation should have this information at their fingertips in one comprehensive document.

To improve operational coordination between all levels of government and the private sector, ideal national response guidance should specify in great detail the federal government's expectations and mechanisms to support state and local coordination and communication. Lack of information synthesis and awareness of command and control structures is cause for duplication of effort, frustration, and inefficient use of resources. Appendices should include organizational charts and wire diagrams that list all of the participating organizations, agencies, and key positions typically involved in each type of incident—in addition to their interrelationships—in great detail. This information must be included in the NRF incident annexes, which should serve as incident-specific templates for action.

The NRF does not clearly depict the breadth of capabilities federal agencies can contribute to a disaster response effort. The document should include an appendix or annex describing specific assets and competencies with approximate, associated costs so states can better understand what is available to them before a federal request is made. Evidence from the Waldo Canyon wildfire case study suggested state and local officials were sometimes confused by what they might be obligating their taxpayers to by leaning too far forward and expending resources in the response. Managing a response without

awareness of available resources fosters hesitancy in operational decision-making. The planned, supplemental Response FIOP, which remains in development, is expected to provide a more detailed concept of operations. The NRF claims, "The Response FIOP further defines the concepts, principles, structures, and actions introduced in this Framework with a specific focus on these elements at the Federal level…. It does not contain detailed descriptions of specific department or agency functions as such information is located in department- or agency-level operational plans."[2] The NRF is already vague in many respects, with the intention of enabling flexibility at all levels of government to tailor response efforts to address unique risks and challenges. If the Response FIOP turns out to be more of the same in terms of flexibility and generality, the emergency management community will continue to scramble to determine who to call and how to coordinate the right assets.

Presidential Policy Directive / PPD-8 demands the "national preparedness system shall include guidance for planning, organization, equipment, training, and exercises to build and maintain domestic capabilities."[3] Results of this study show that familiarity with the federal processes and procedures is an area in need of improvement at the state and local levels. Enhancements to the NRF can help close the gap. The NRF should outline a federally-sponsored training regimen that incorporates state and local governments in remote, virtual simulation exercises to increase intergovernmental interactions and reinforce national disaster response concepts. This step may prove to be a large undertaking with substantial upfront costs for FEMA; however, this would likely be a cost-saving endeavor compared to the alternative option of increasing the number of national level exercises to meet the same objectives.

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Incident Annexes should be expanded to include MOEs and to define desired end states in order to strengthen information plans. Both the Joplin and Sandy case studies showed a shortfall in the response community's ability to translate data collection to inform decision-making. Similar to the ideas presented by Patrick Stevens and Mark Smith in their Mission-Centered Solutions report, a standardized methodology to communicate intent and prioritize objectives (i.e. synchronization matrix) must be established that leads to a common understanding of priorities and visualization of the desired end state across the disaster response network. Unlike Steven's and Smith's idea to change NIMS to create steps that institute a "top-down" intent, the methodology should reflect a command intent conveyed by the UCG, which incorporates state or local representation. State and local officials best understand the desired end state because they have the greatest vested interest in their communities. Federal or other outside resources would provide support and input to this visualization process. This methodology must be included in the NRF to encourage a shared awareness of strategic objectives.

The NRF presents the 14 core capabilities as complementary equals; however, this is a misrepresentation. The results of this study showed there is an innate hierarchy between planning, operational coordination, and the rest of the core capabilities. On several occasions, such as the lack of preparation that went in to the selection of the ICP at the Waldo Canyon wildfire resulting in poor communication capability, shortfalls within certain core capabilities were a direct result of deficiencies in planning or operational coordination. This point must be stressed in the NRF. These capabilities must be given new descriptors such as "foundational capabilities" or the like, to reinforce the

idea that those two core capabilities have cascading effects on the remainder of core capabilities.

Recommendations for Further Research

Potentially useful areas to further the research presented in this multiple case study include the following: (1) compare cases in this study to similar-size disasters from the past 20 years to help measure progress achieved, (2) conduct a rigorous, academic exercise, comparing each of the previous federal frameworks and plans to one another to show the evolution of guidance over the past 35 years and associated criticisms along the way, (3) conduct a focused study to learn how states prepare and plan for disasters and what bureaucratic obstructions they face, and (4) explore the utility of the NRF in its role to serve as the overarching construct when specific federal agencies have authority to declare unique types of disasters or emergencies, such as oil spills, livestock diseases, or human pandemics.

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[1]FEMA, *Hurricane Sandy: FEMA After-Action Report*, V; Kia Gregory, "City Adds 600,000 People to Storm Evacuation Zones," *The New York Times*, http://www.nytimes.com/2013/06/19/nyregion/new-storm-evacuation-zones-add-600000-city-residents.html?_r=0 (accessed 23 May 2014); Gibbs and Holloway, "Hurricane Sandy After Action," 7; Rogers, "Changes after Waldo Canyon fire."; Michael Parker, "RAHP Factsheet," email message to author, 28 April 2014.

[2]DHS, *National Response Framework,* 2nd ed., 45.

[3]President, "PPD-8: National Preparedness," http://www.dhs.gov/presidential-policy-directive-8-national-preparedness (accessed 17 May 2014), 2.

GLOSSARY

Automated Deployment Database (ADD). A central database used to ensure the accuracy of employee information and deployment records, determine workforce readiness, track personnel, and generate accurate reports of FEMA deployment activity for use by the DHS/FEMA management. (Federal Emergency Management Agency, "FEMA Reservist Program," FD 010-6 Revision Number: 01 (14 June 2012), http://www.fema.gov/media-library-data/20130726-1837-25045-7941/fd010_6.reservist_policy_directive.pdf (accessed 23 May 2014)

Catastrophic Incident. Any natural or manmade incident, including terrorism, that results in extraordinary levels of mass casualties, damage, or disruption severely affecting the population, infrastructure, environment, economy, national morale, or government functions. (DHS, NRF, 2nd ed., 1)

Crisis Action Planning. Time-sensitive planning conducted in response to a specific, imminent threat or to an incident that has already occurred. (FEMA, *Hurricane Sandy: FEMA After-Action Report*, 15)

Common Operating Picture. An overview of an incident created by collating and gathering information—such as traffic, weather, actual damage, resource availability—of any type (voice, data, etc.) from agencies or organizations in order to support decision-making. (DHS, *National Incident Management System*, 23)

Deliberate Planning. Planning conducted under nonemergency conditions to prepare for known or perceived risks arising from natural hazards or man-made threats. (FEMA, *Hurricane Sandy: FEMA After-Action Report*, 15)

Emergency. Any occasion or instance for which, in the determination of the President, Federal assistance is needed to supplement State and local efforts and capabilities to save lives and to protect property and public health and safety, or to lessen or avert the threat of a catastrophe in any part of the United States. (*Stafford* Act, 42 U.S. Code § 5122)

Emergency Management. An ongoing process to prevent, mitigate, prepare for, respond to, maintain continuity during, and recover from an incident that threatens life, property, operations, or the environment. (*NFPA 1600: Standard on Disaster/Emergency Management and Business Continuity Programs*, 2010 Edition)

Emergency Management Assistance Compact. An interstate mutual aid agreement that allows States to assist one another in responding to all kinds of natural and manmade disasters. It is administered by the National Emergency Management Association. (FEMA, "Preparedness," [http://www.fema.gov/preparedness-0 (accessed 16 May)]

Hazard. An emergency or disaster resulting from (a) a natural disaster, or (b) an accidental or man-caused event. (42 U.S. Code § 5195)

Incident Management Team. A comprehensive resource (a team) to either augment ongoing operations through provision of infrastructure support, or when requested, transition to an incident management function to include all components and functions of a Command and General Staff. [U.S. Fire Administration, "About Incident Management Teams." https://www.usfa.fema.gov/fireservice/ops_tactics/type3_imt/imt-about.shtm (accessed 23 May 2014)]

National Preparedness. The actions taken to plan, organize, equip, train, and exercise to build and sustain the capabilities necessary to prevent, protect against, mitigate the effects of, respond to, and recover from those threats that pose the greatest risk to the security of the Nation. (DHS, *National Preparedness Goal*, A-2)

Natural Disaster. Any hurricane, tornado, storm, flood, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, drought, fire, or other catastrophe in any part of the United States which causes, or which may cause, substantial damage or injury to civilian property or persons. (42 U.S. Code § 5195)

Red Flag Warning. The National Weather Service issues Red Flag Warnings & Fire Weather Watches to alert fire departments of the onset, or possible onset, of critical weather and dry conditions that could lead to rapid or dramatic increases in wildfire activity. A Red Flag Warning is issued for weather events which may result in extreme fire behavior that will occur within 24 hours. (Colorado Springs, *Waldo Canyon Fire*, 105)

Resilience. The ability to adapt to changing conditions and withstand and rapidly recover from disruption due to emergencies. (DHS, *National Preparedness Goal*, A-2)

Storm Surge. The "dome" of ocean water propelled by the winds and low barometric pressure of a hurricane. (Gibbs and Holloway, "Hurricane Sandy After Action," 9)

Type. The level of resource capability. Assigning the Type I label to a resource implies that it has a greater level of capability than a Type 2 of the same resource (for example, due to its power, size, or capacity), and so on to Type 4. Typing provides managers with additional information to aid in the selection and best use of resources. (DHS, *National Incident Management System*, 43)

Wildland Urban Interface. Areas where homes are built near or among lands prone to wildland fire. Depending on the area of the country, fire departments might refer to wildland fires as brush fires, forest fires, rangeland fires, or something else; however, they are all part of the WUI and all pose the same threat to local assets. The increase in the WUI threat has been steep because of continued

development and exposure. (Ready, Set, Go!, http://www.wildlandfirersg.org/ Learn/content.cfm?ItemNumber=646, (accessed 23 May 2014)

APPENDIX A

OPERATIONAL ENHANCED FUJITA (EF) SCALE

EF Number	3 Second Gust (mph)
0	65-85
1	86-110
2	111-135
3	136-165
4	166-200
5	Over 200

Source: National Weather Service, "NWS Central Region Service Assessment: Joplin, Missouri, Tornado—May 22, 2011," http://www.nws.noaa.gov/om/assessments/pdfs/Joplin_tornado.pdf (accessed 19 May 2014), 28.

APPENDIX B

SAFFIR-SIMPSON HURRICANE WIND SCALE

| Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 kt 119-153 km/h	**Very dangerous winds will produce some damage:** Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 kt 154-177 km/h	**Extremely dangerous winds will cause extensive damage:** Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph 96-112 kt 178-208 km/h	**Devastating damage will occur:** Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph 113-136 kt 209-251 km/h	**Catastrophic damage will occur:** Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157 mph or higher 137 kt or higher 252 km/h or higher	**Catastrophic damage will occur:** A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Source: National Hurricane Center, "Saffir-Simpson Hurricane Wind Scale,"
http://www.nhc.noaa.gov/aboutsshws.php (accessed 15 May 2014).

APPENDIX C

FEMA REGIONS
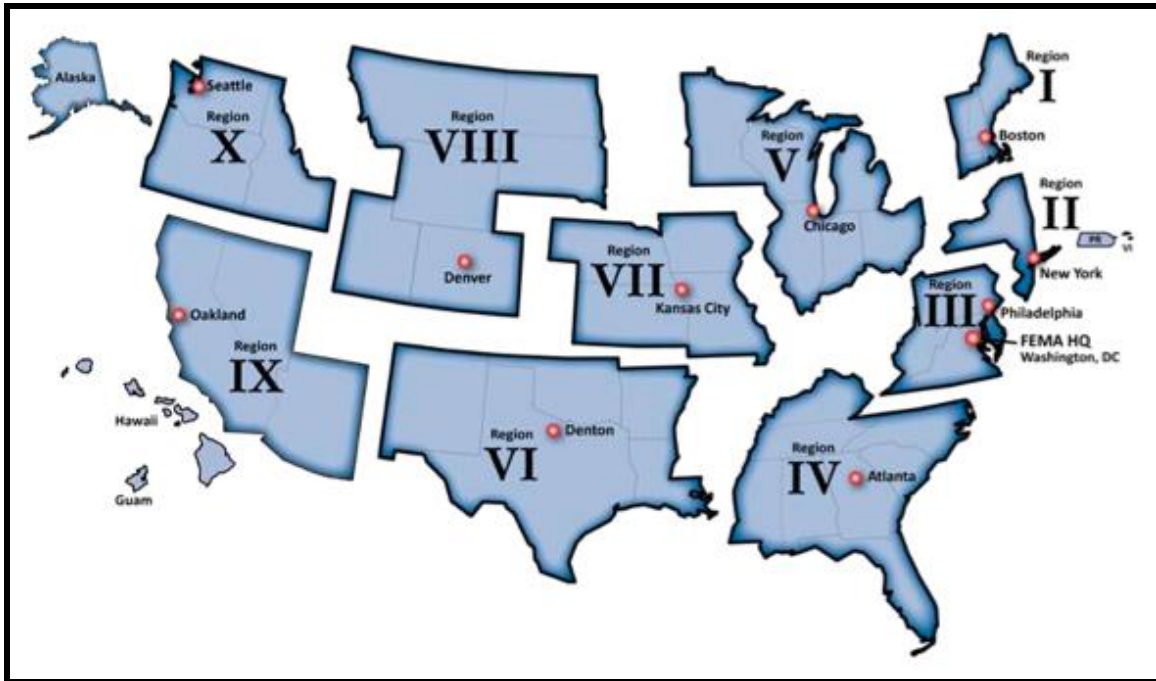
Source: Department of Homeland Security, *National Response Framework,* 2nd ed., (Washington, DC: Government Printing Office, 2013), 42.

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